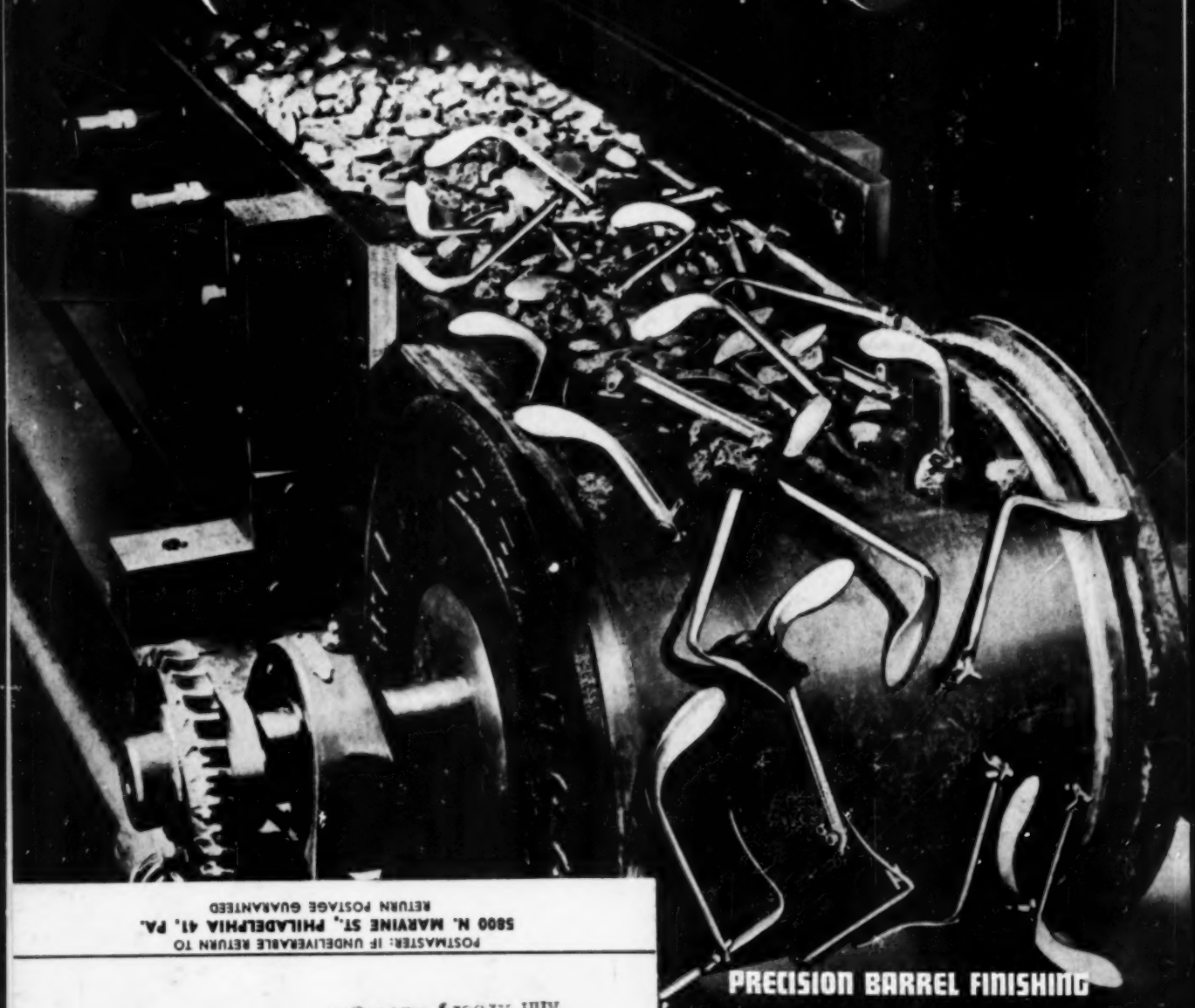
VOLUME 41
NUMBER 1

JANUARY, 1954

plating



PRECISION BARREL FINISHING

See Contents Page 39

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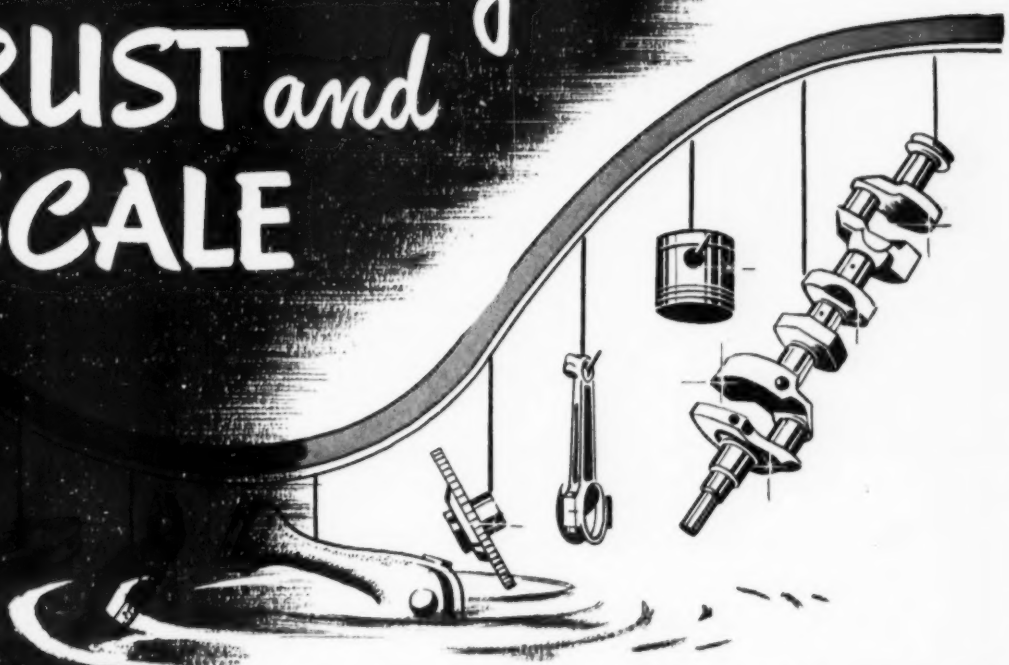

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In This Issue

Acceptance Sampling of Electroplated Articles by J. M. Cameron and Fielding Ogburn. Acceptance sampling procedures have found widespread usage in governmental and industrial purchasing. In this paper the authors present some of the basic ideas behind acceptance sampling. Two figures illustrate the text.

The Determination of Boric Acid in Nickel Plating and Acid Zinc Plating Baths by Means of Cation Exchangers by Gunnar Gabrielson. This paper tells of the use of an ion exchange method to remove those metal ions which interfere in the analysis of boric acid. The author reports on three different nickel solutions and two different zinc baths, citing an accuracy of <0.5 per cent. Three tables and five references are furnished with the text.

Precision Barrel Finishing by Malcolm Maynes. The author discusses modern barrel-finishing methods and lists the various types of barrels, auxiliary equipment, barrel-finishing media and cleaners that are used. He also details, as an aid in determining the exact procedure to be used on any given parts, a 7-step operating procedure for a roughing run and a 9-step procedure for a finishing run. Several practical operating hints are given. Nine figures illustrate the article.

The Nature, Cause and Effect of Porosity in Electrodeposits. I. The Porosity of Electrodeposits by Fielding Ogburn and Asaf Benderly. AES Research Project No. 13. The initially conceived program of this Project was to correlate the gas permeability measurements of deposits with the behavior of those deposits in atmospheric exposure tests. In the course of this study a photographic method of porosity detection was developed; additional information was gained on the nature and measurement of porosity, and about the development of porosity by accelerated corrosion.

For page numbers, see Table of Contents, page 39

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy

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Industry News

Cowles to Expand Skaneateles Falls Plant. Cowles Chemical Company, with general offices at Cleveland, Ohio has announced that construction of a 20,000 sq ft addition to their plant at Skaneateles Falls, N. Y., is now under way.

When completed in mid-1954, the addition will provide for increased warehouse space and a new plant office and control laboratory, as well as expanded research facilities and pilot plant operations.

New Sarco Sales Office. Sarco Company, Inc., has established new a sales office at 35 Elmira St., San Francisco. This branch office will represent Sarco exclusively in Northern California.

J. S. Spear, sales manager of the new branch office, has been associated with Sarco Company, Inc., for over 15 years, serving as sales engineer in the New York territory. He is a professional engineer, a member of the Society of Plastics Engineers and the American Society of Heating and Ventilating Engineers.

Change of Address Notice. Special Chemicals Corporation wishes to announce that because of continued increased requirements on their office facilities, they have moved to new and larger quarters at their Ossining plant. The company's new address:

100 S. Water St., Ossining, N. Y.

New Address for ACP Detroit Office. American Chemical Paint Company's Detroit Office has moved to 10225 W. McNichols Rd., Detroit 21, Mich. D. L. Miles, Manager of the midwest territory, is supported by a staff of technical sales-service representatives consisting of J. B. Rohrer, J. J. Linden, O. E. Crisler and other field representatives.

Miles

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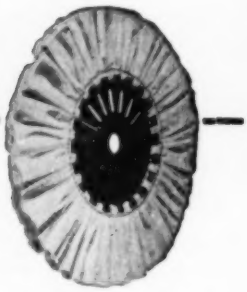

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As in the past, warehouse stocks of ACP's complete line of rustproofing chemicals, phosphate coating chemicals, and metal cleaners, rust removers, and pickling acid inhibitors are maintained for emergency purposes.

Free Course in Electroplating. The course of study in electroplating, given at the Brooklyn Evening Technical High School, 29 Fort Greene Place, Brooklyn 17, N. Y., will begin its Spring term session February 1, 1954. Classroom discussion and laboratory experiments are included in the course. Individual experiments in the methods of analysis of copper, nickel, chromium and silver baths are performed, additional laboratory work covers anodizing, Hull cell operation and study, *p*H meter operation, plating on plastics and thickness measurement by

Sustaining Members

The list of AES Research sustaining members continues to grow and the number of memberships climbs closer to the 400 mark with the addition of still another organization. Listed in the latest report sent into Headquarters by the Detroit Branch, is the **C. D. Sparling Company, Detroit, Mich.**

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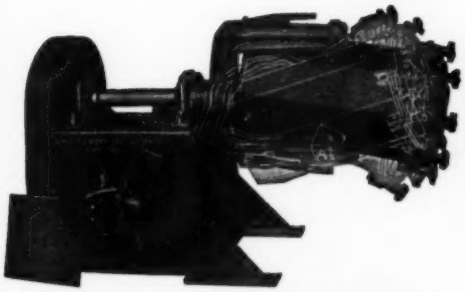

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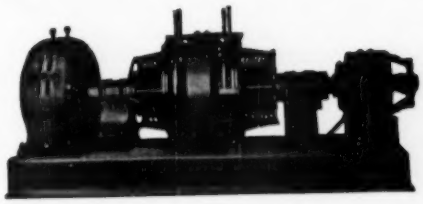

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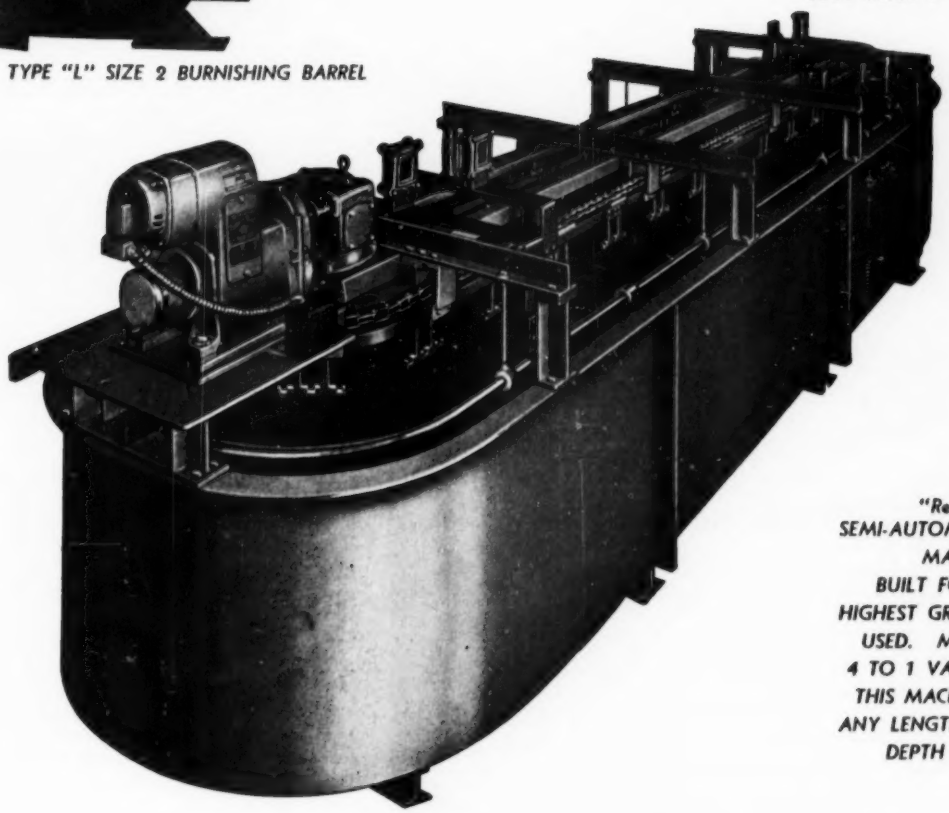

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Industry News

chemical methods of zinc, cadmium, nickel, chromium. Classroom topics include a review of the fundamentals of elementary chemistry, tank area calculations, Baumé and specific gravity readings, brighteners, wetting agents, buffer agents, pitting, deionizing.

Registration begins January 25, 1954 and daily thereafter from 7:00 to 9:00 P. M. Classes meet Monday and Wednesday nights from 6:45 to 8:15 P. M. plus about six Friday nights during the term. The term runs from February 1 to June 30, 1954. Ask for Mr. L. Serota in room BW17 or 3E12.

New Division Formed. As part of its program of expansion in the extrusion of pipe and the fabrication of plastic structures, Atlas Mineral Products Company, Mertztown, Pa., announces the formation of its Thermoplastic Structures Division.

This division will be responsible for the sale and field fabrication of Atlastavon (plasticized polyvinyl chloride), Ampcoflex (rigid unplasticized polyvinyl chloride), Pee Vee Cee (optimum impact rigid polyvinyl chloride), Ampcolite (high impact styrene copolymer blends) and Plastaloy (reinforced polyesters).

DeVilbiss Spray Painting School on West Coast. Paint finishing foremen on the west coast have a new conception of spray techniques as a result of six schools conducted this summer by George I. Stoddard, DeVilbiss Company spray painting instructor, at the company's Santa Clara plant and the University of Santa Clara.

These spray painting classes will have a far-reaching effect since those attending the school will in turn tri in other operators either within their organization or under their jurisdiction, according to a company spokesman.

DeVilbiss inaugurated the west coast schools last summer and it is expected that the classes will continue to be held there annually. The schools, each of one week's duration, were divided to accommodate personnel from automotive jobbers, industry, maintenance and contract painters, and government establishments.

New Belke Sales Office

Entrance to the new sales offices of Belke Manufacturing Company. To meet growth requirements, offices of William E. Belke and the sales department have been moved to new quarters.

New Stainless Steel Wire Mill. In Metropolitan New York Area, the block-long Jersey City plant of Kenmore Metals has become a large producer of stainless steel wires. The new Kenmore mill is equipped with the most modern facilities for mass-production that utilizes revolutionary electroplating techniques for nickel plated steel wire that were introduced by Kenmore Metals a few years ago.

Special types of stainless wires are also produced. They include tin-plated stainless steel armature banding wire for electric motors and generators, diamond-drawn stainless steel electrode wire for automatic welding, copper-plated stain-

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less steel rivet wire, telephone lashing wire and many other special stainless steel wire products.

Maintenance & Engineering Conference. Fifty-seven experts, drawn from all industries, will address the Plant Maintenance & Engineering Conference to be held in Chicago, concurrently with the Plant Maintenance & Engineering show, January 25–28, 1954. The conference will take place at the Hotel Conrad Hilton and the show at the International Amphitheatre.

The exposition will be the largest ever held in the field. Thousands of new products will be shown. The show is now among the five largest annual industrial shows held in the country.

High light of this year's conference will be a panel headed by 16 speakers at the close of the proceedings at which an effort will be made to answer all previously unanswered questions. The chemical, petroleum refining, sheet metal, and steel mills industries will receive special attention. Two round tables will be devoted exclusively to their respective problems.

New Representative for Holcroft. The selection of the Day Engineering Company of Ardmore, Pa., to represent Holcroft and Company in the east has been announced.

Headed by William T. Day, the organization will cover eastern Pennsylvania, all of Delaware, and parts of Maryland and New Jersey.

Holcroft & Company supplies electric, gas or oil fired furnaces for every production heat treating requirement, individually designed for the specific job. These include gas carburizing and controlled atmosphere furnaces; convection and open fired furnaces; and car type, continuous conveyor type, rotary and pusher type furnaces.

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New Regional Office for Parker Rust Proof Co. Establishment of a new South Central Region was announced by M. B. Roosa, vice-president and sales manager of Parker Rust Proof Company, Detroit, at the company's annual sales-service meeting in Detroit recently.

The new region will include the southeastern and south central states. B. L. Dittmore, veteran of 12 years on the sales-service staff of Parker, is named manager of the South Central Region. He will have men stationed strategically throughout the territory, to serve the metal working industries in these states.

The new region office is at 1246 W. 70th St., Cleveland 2, Ohio.

Metallizing Consulting Firm. H. V. Anderson has announced the formation of H. V. Anderson Associates, Metallizing Consultants on precious metal paints, noble metal recovery, and metallizing contractuals. Serving the glass, ceramic and electronic industries, the new firm is located at 239 Park Ave., Berkeley Heights, N. J.

New England Sales Office of American Nickeloid Company, of Peru, Ill., manufacturers of pre-plated metals in sheets and coils, has been moved from Beverly, Mass., to 250 Boylston St., Boston 16, Mass.

Remaining in charge of the New England office will be John F. Schoellhorn, who has been with the company for the past sixteen years, six of these in this territory.

Gaillard Seminar, January, 1954. Dr. John Gaillard, mechanical engineer, staff of the American Standards Association, and lecturer at Columbia Univer-

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sity, will hold his next five-day private seminar on industrial standardization from January 25 through 29, 1954, in the Engineering Societies Building, 29 W. 39th St., New York City.

The seminars were started in 1947 upon request from companies for assistance in the organization of their standardization work and the training of their men in writing standard specifications. More than 120 organizations have been represented so far.

Further details concerning registration may be obtained from Dr. John Gaillard, 400 W. 118th St., New York 27, N. Y., or through the office of the American Standards Association, 70 E. 45th St., New York 18, N. Y.

New Stainless Steel Alloy. A master alloy of five per cent beryllium in iron has been announced by the Beryllium Corporation as a new product. It is designed as an answer to increasing demands on the part of ferrous producers for beryllium additions to stainless steels.

The material, though already in commercial use for some months, was exhibited by the company to the public for the first time at the recent National Metal Exposition and Congress in Cleveland.

The ferro-beryllium master alloy is valued chiefly for its contribution to the hardenability of stainless steel.

SOMETHING NEW has been added to mail leaving AES National Headquarters Office. Gladys Del Tufo (left) of the Advertising Department points out to Ann Panico (right) of the Editorial Office, the new postage slogan publicizing the important Society Research Program. Slogan reads: "Plating Progress Thru AES Research—Join as an Industry Sustaining Member Today." Sustaining Membership Dues are $100 annually. Members receive advance research information, periodic research reports, monthly issues of PLATING, *a suitably inscribed certificate and* PROCEEDINGS, *the publication containing research papers presented at the AES Convention and a record of business transactions*

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Intersociety News

NFMF Seminar

The National Federation of Metal Finishers will hold its first management seminar at the Conrad Hilton Hotel, Chicago, on Saturday, January 30, 1954.

Meeting concurrently with the Chicago Branch, AES annual educational session, the job shop group will present the following program:

9:30 A. M.

S. J. Fecht, Management Consultant, Chicago, "Work Simplification Programs for the Metal Finisher"

John B. Thorsen, Atwood Vacuum Machine Co., Rockford, Ill., "Laying Out Production Lines for a Job Shop"

2:30 P. M.

H. J. Hubenthal, Electran Mfg. Company, Chicago, "Budgetary Controls for Small Business Establishments"

Max Becker, Certified Public Accountant, Chicago, "Organizing Your Business for Tax Advantages"

New ASTM Staff Member

The American Society for Testing Materials has announced the appointment as Special Assistant, on the Headquarters Staff, of Fred F. Van Atta, recently with Associated General Contractors; and formerly acting Secretary-Treasurer of the American Concrete Institute and editor of the ACI Journal. For the immediate future, Van Atta will concentrate his work on coordinating and extending the ASTM developmental and promotional activities, but special assignments will be made from time to time. In this work, he is reporting directly to ASTM Executive Secretary, R. J. Painter.

IMF Paper Award

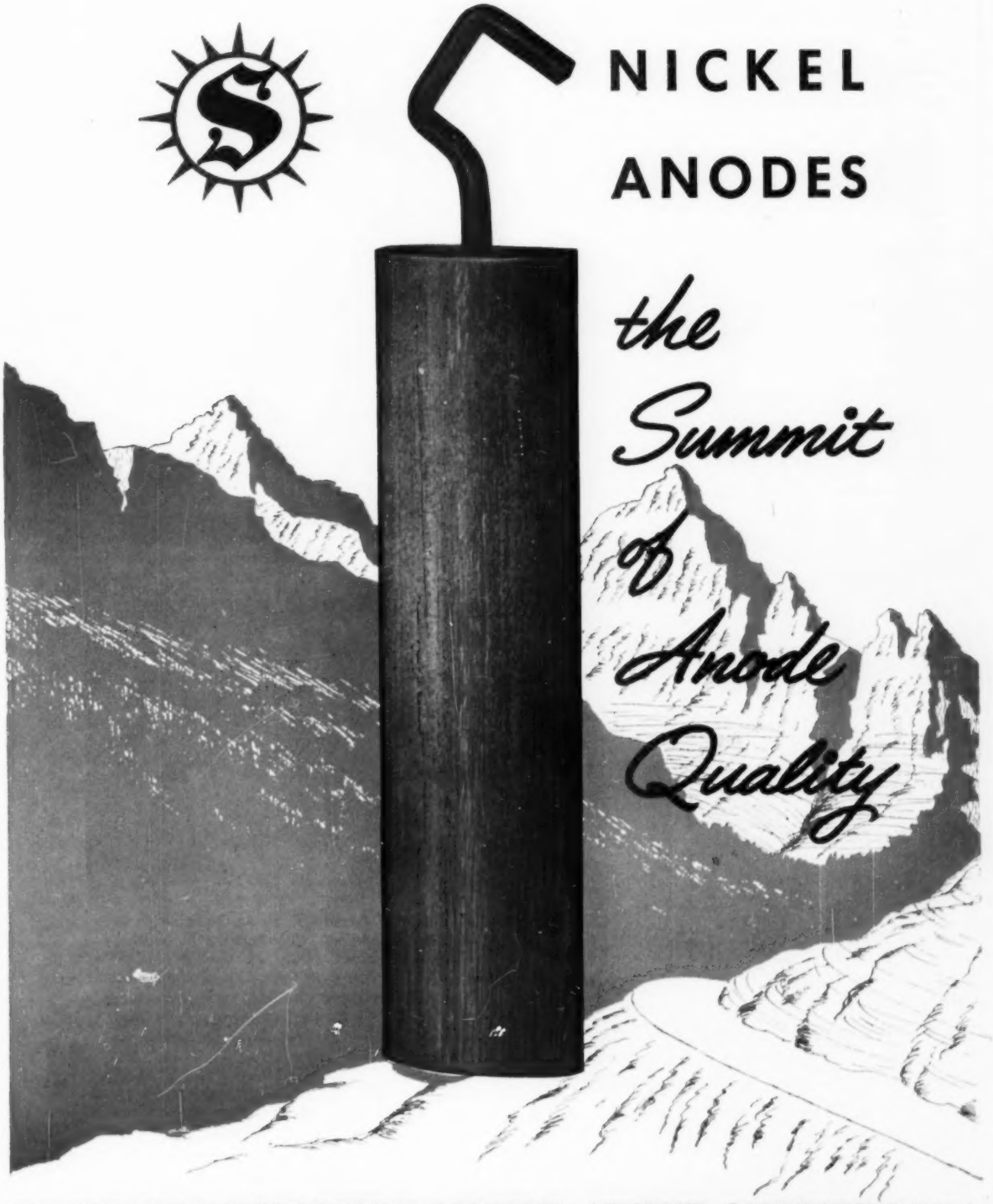
Council of the Institute of Metal Finishing has, on the recommendation of the Publications Committee, awarded the Westinghouse Brake and Signal Company Ltd. prize for the 1952–1953 session to Messrs. A. E. Davies, R. M. Angles, and J. W. Cuthbertson, joint authors of the paper—"Complex Fluorides for the Deposition of Tin and Tin Alloys."

The paper was presented during the Annual Conference held in April.

ISA Regional Conference

The Instrument Society of America will hold its 9th Annual Regional Conference on Wednesday, February 4, 1954 at the Hotel Statler in New York City. A symposium on "Progress in Measurement" will be presented.

SEYMOUR



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1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C., Synchronous, Exciter-in-head.
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1—3000/1500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS,** Synchronous, Exciter-in-head.
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
1—2000/1000 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS.**
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS.**

ANODIZERS

1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

RECTIFIERS

BRAND NEW BASIC RECTIFIERS, 1500/750 amperes, 6/12 volts. Special Price: $750.00 each. Separate Voltage Controls available.
1—2000 AMPERE, 6 VOLT, **G. E.** COPPER OXIDE, and Control.
1—**GREEN SELECTROPLATER,** 1800 AMPERE, 12 VOLT, 220/3/60.
1—**UDYLITE-MALLORY,** 1500/750 AMPERE, 6/12 VOLT, and Control.

SPECIAL

1—**MERCIL** 12 x 12 CENTRIFUGAL DRYER, Electric Heat.
1—**KREIDER** 12 x 12 CENTRIFUGAL DRYER, Steam Heat.
1—**CROWN** 18 x 18 CENTRIFUGAL DRYER, Steam Heat.
4—24" and 30" **ROBBINS & MYERS** 2-SPEED VENTILATING FANS.
3—No. 1 **HARTFORD** TRIPLE-ACTION BURNISHING BARRELS, Lined and Unlined, Belted.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

WIRE—PHONE—WRITE

M. E. BAKER CO.

93 WHEELER STREET

Kirkland 7-5460 **CAMBRIDGE 38, MASS.**

Personals

Paul J. Lalonde has been appointed Supervisor of Engineering Department, Bart-Messing Corporation, Belleville, N. J.

Well known in the electroplating industry, particularly in the graphic arts field,

Lalonde

Lalonde brings a wealth of professional experience to his new position. Previously, he was associated with American Cyanamid Company as Plant Chemical Engineer at the Warner-Linden plant. In addition, he was a consultant on plating plant installations, and spent more than nine years with Hanson-Van Winkle-Munning Company in both development and sales engineering work.

In the graphic arts field Lalonde is best known for his development work in plating plants for electrotyping and rotogravure work. He has had numerous technical papers published on nickel plating and tin plating processes for electrotypes, as well as plant layout for these operations.

Lalonde is a graduate of Rensselaer Polytechnic Institute, where he majored in Chemical Engineering.

William A. Ross has been appointed sales manager of the Circo Equipment Company, Clark (Rahway), N. J.

Ross has been active in the metal finishing field for the past 20 years, and the last 4 years has engaged in sales activities of metal cleaning equipment and solvents.

A member of the ASM and the AES, his background of experience includes 10 years with Bendix Aviation Corporation where he was in charge of finishing operations at three of that company's plants. He also held similar positions with the Hammerlund Manufacturing Company of New York City and Pitney Bowes Postage Meter Company of Stamford, Conn.

G. A. T. Washburn has been named special assistant to President, **S. G. Thornbury,** Turco Products, Inc.

Early in 1954, ground will be broken on a thirty-acre site in North Wilmington, Calif., for a new million-dollar plant which will house all of Turco's home-office manufacturing, sales, and administration. In this complex new operation a man of

The 25th anniversary of Leonard T. Beale, Chairman of the Board of the Pennsylvania Salt Manufacturing Co. (seated, second from left), was observed recently at a luncheon attended by Company executives. Mr. Beale became President of Pennsalt in 1928 and has been Board Chairman since 1949. Here Pennsalt President George B. Beitzel (seated, second from right) presents Mr. Beale his certificate of membership in Pennsalt's Diamond Keystone Club. Others are: Seated, left, Paul Kendall, President, Sharples Chemicals Inc., a Pennsalt subsidiary; and right, William F. Mitchell, Pennsalt's Vice-President in Charge of Manufacturing. Standing, left to right: Dr. W. A. LaLande, Manager of Research and Development; George T. Collins, Assistant to the President; Edward F. Beale, Treasurer; Lee H. Clark, Executive Vice-President, Sharples Chemicals Inc.; Richard L. Davies, President, Pennsalt International Corp., and Fred C. Abbott, Pennsalt Manager of Personnel

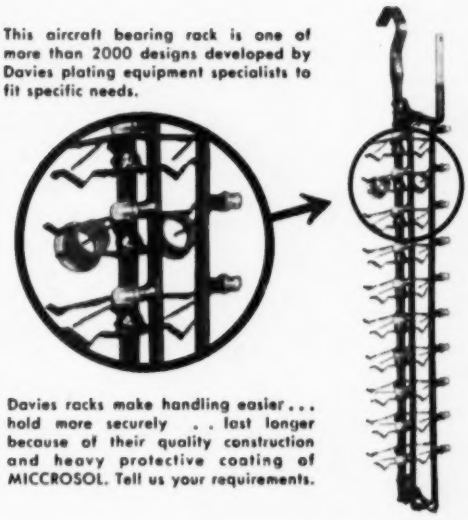
PLATING

RACK

PROBLEMS?

Davies Custom Made Plating Racks will come to your aid . . .

This aircraft bearing rack is one of more than 2000 designs developed by Davies plating equipment specialists to fit specific needs.



Davies racks make handling easier . . . hold more securely . . last longer because of their quality construction and heavy protective coating of MICCROSOL. Tell us your requirements.

WRITE TODAY FOR COMPLETE DETAILS

LET Davies SERVE YOU

OUR SERVICE COVERS THE GREAT SOUTHWEST

Davies is southwestern sales and service representative for the "blue ribbon" firms of the plating and polishing industry.

- THE UDYLITE CORPORATION
- FREDERICK B. STEVENS, INC.
- MacDERMID, INC.
- ALLIED RESEARCH PRODUCTS (Iridite)
- ALMCO DIVISION, QUEEN STOVE WORKS
- METALWASH MACHINERY CORPORATION
- INDUSTRIAL ELECTROPLATING CO. (Niehaus Fume Separators)
- R. O. HULL AND COMPANY
- CIRCO EQUIPMENT COMPANY
- ALROSE CHEMICAL COMPANY (Jetal Process)

—and many others

depend on

EQUIPMENT

MATERIALS

KNOW-HOW

Personals

Rear Admiral "Gat" Washburn's experience is indispensable.

He is the man who planned and supervised the building of the Naval Air Station at Glenview, Ill. He was also associated with Hughes Aircraft in Tucson.

Washburn graduated from Annapolis in 1923 and earned his Navy wings the following year. He was one of the proponents and pioneers of the then controversial field of naval aviation. He has logged 16,000 hours in the air.

Samuel H. Greenwood has been designated by F. J. Stokes Machine Company district manager of a newly enlarged territory, with headquarters in Philadelphia.

Formerly manager of extruder sales, Greenwood will now have charge of sales and services for all Stokes products in eastern Pennsylvania, upstate New York, lower New Jersey, Delaware, and the southeastern U. S.

Assisting Greenwood in the new district office will be **Walter E. Rayher** and **Joe D. Robertson. Larry Morehouse** and **Fred Hillsley** have joined the Stokes sales staff and are attached to the Philadelphia district office for their initial training.

Greenwood received his B.S. in Mechanical Engineering from Case Institute of Technology in 1941. He worked as a development engineer for the American Meter Company before joining the Stokes organization in 1949.

George J. Dawson, Gil Valentine and **James Filkins** were named factory district representatives in sales and service engineering by the Industrial Filter & Pump Manufacturing Company, Chicago 50, Ill.

Dawson will cover Pennsylvania and western New York from the new branch

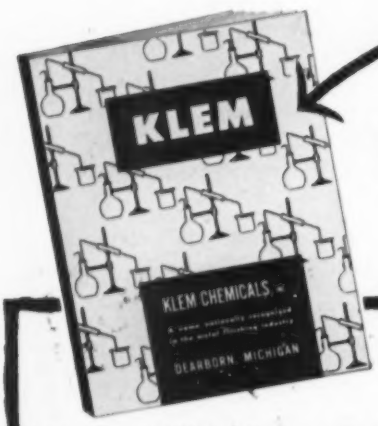
Dawson **Valentine**

offices at 834 Lovitt Way, Pittsburgh 12, Pa., and 808 Land Title Building, 1400 Chestnut St., Philadelphia, Pa. Before joining Industrial Filter & Pump Mfg. Co., he was a staff chemist with Infilco, Inc., and engineer and chemist for Commonwealth Edison Company, Chicago.

Filkins

Valentine will serve the Michigan area from the new Detroit branch office at 424 Book Building, Detroit, Mich. Previously, he was sales and service engineer in the plating chemicals division of the McGean Chemical Co., sales engineer with Wagner Bros., Inc., and sales manager of technical processes with Promat Division of Poor & Company.

Filkins will cover the states of Texas and Oklahoma from the new Dallas branch office at Dorchester House, Dallas, Texas. Previously, Filkins was analytical and development chemist for Pure Oil Company and manager of the petroleum section for Commercial Testing & Engineering Co.



Write for this catalog — describes 31 standard surface preparation chemicals, electrolytic and emulsion cleaners, one stage strippers, etc.

Your difficult surface cleaning problem may be a "pushover" for the experts

Klem Field Engineers are specialists in the cleaning and preparation of parts surfaces, qualified to solve most problems on the spot — backed by lab facilities that duplicate your plant conditions and where a quick answer may be had on the particularly tough jobs.

You'll like working with Klem. They'll get results for you and make your work easier.

There's a KLEM engineer near you

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CHEMICALS, Inc.
14401 LANSON AVE., DEARBORN, MICHIGAN

FINISHING FOREMAN

Experienced foreman with both barrel and still. Make and maintain all solutions, copper, nickel, chrome, silver, brass, zinc, cadmium, tin. Have done extensive work with aluminum bright dips.

Reply to:

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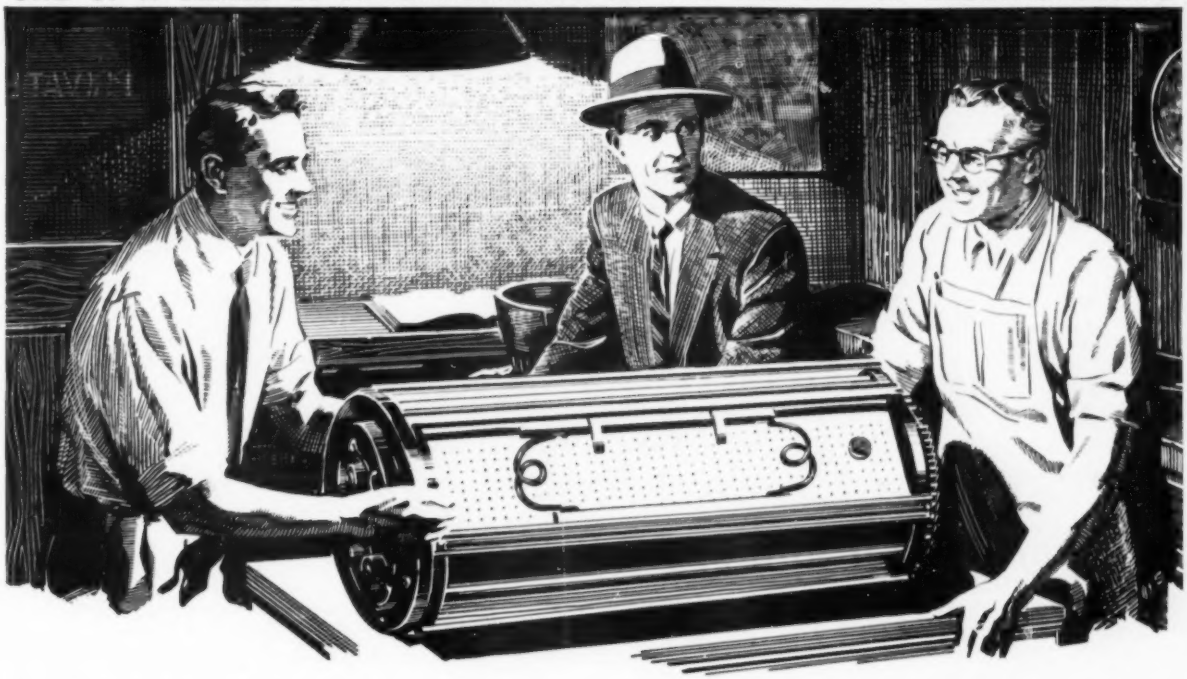
ONE OF A SERIES OF ADVERTISEMENTS ON THE HISTORY OF ELECTROPLATING



a midnight sale that opened **the door to new plating profits**

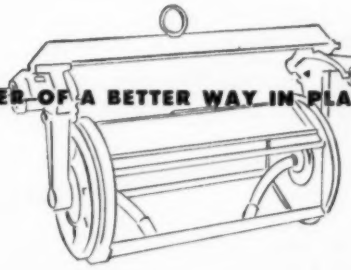
Back in 1934, Udylite's young president, L. K. Lindahl, threw the necessary parts for a complete plating barrel into his car and headed for Kokomo, Indiana. He arrived at midnight. His prospective customers – a plating shop owner and the superintendent–were waiting for him.

On the shop owner's desk, Lindahl assembled, disassembled and reassembled the barrel. It was a perfect machine fit of parts picked at random from stock. It was the first barrel providing perfect assembly of standard parts! Easily removable panels and other superior features of the barrel completely sold both men. Udylite got the order!

The months of research by the Udylite technical team had paid off! The barrel was unique because it was made from a material heretofore untried . . . hard rubber. In addition, electricity was conducted through the ends of the barrel by easily removable contacts. This first Udylite Barrel had again provided *a better way* in plating.

Udylite knew they had the best unit in the industry –one that upped production, cut costs, saved manpower. But the "midnight sale" proved the acceptance and value of this revolutionary product.

In the following years, Udylite Corporation continued to pioneer improvements and innovations in plating barrels. Bakelite, hard rubber and melamine materials were followed by the present super-resistant lucite plating cylinders. But that's not all! Udylite engineering and research teams are constantly at work perfecting still better materials, methods and equipment . . . all designed to give you better plating at lower cost.



PIONEER OF A BETTER WAY IN PLATING...

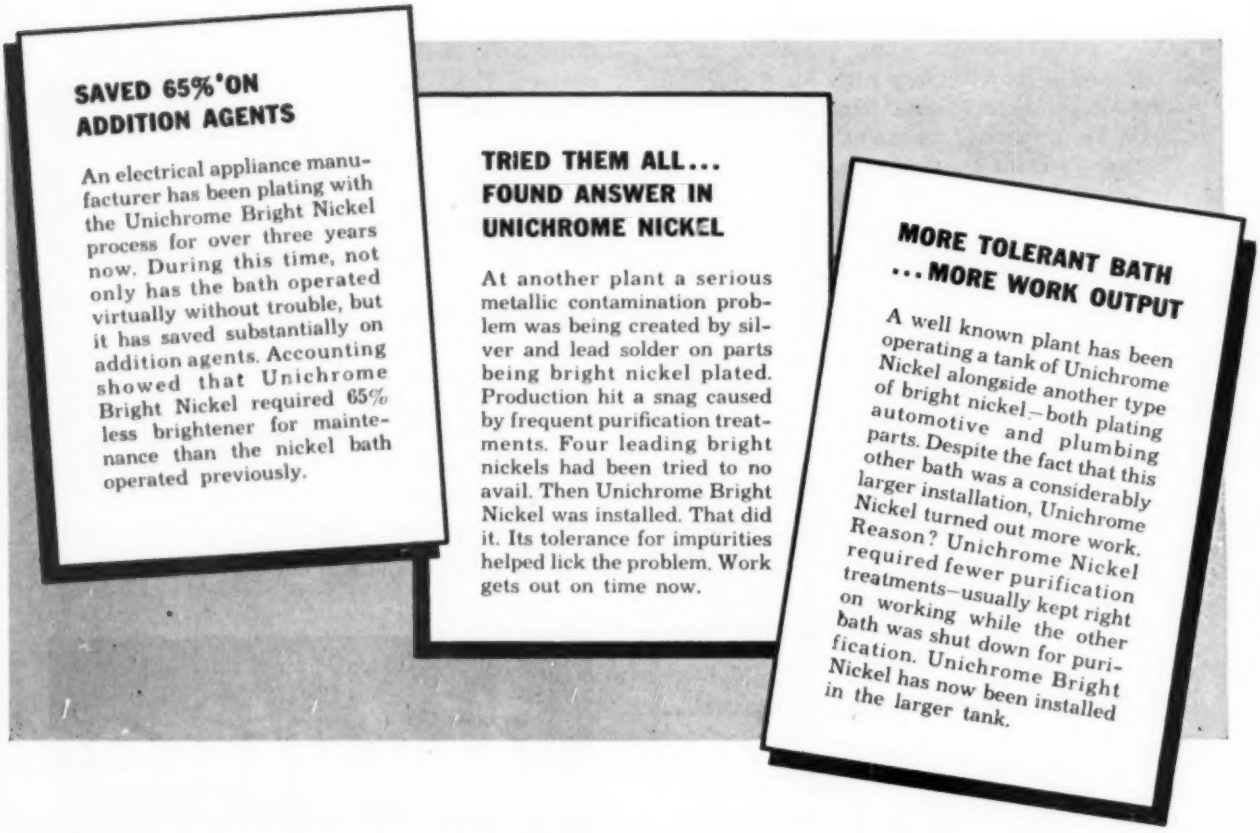
THE Udylite CORPORATION
DETROIT 11, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 116.

Proved in commercial plating operations

the UNICHROME

Service-proved features include economy, stability, ease of control and sparkling nickel deposits with better receptivity for chromium plate



SAVED 65%* ON ADDITION AGENTS

An electrical appliance manufacturer has been plating with the Unichrome Bright Nickel process for over three years now. During this time, not only has the bath operated virtually without trouble, but it has saved substantially on addition agents. Accounting showed that Unichrome Bright Nickel required 65% less brightener for maintenance than the nickel bath operated previously.

TRIED THEM ALL... FOUND ANSWER IN UNICHROME NICKEL

At another plant a serious metallic contamination problem was being created by silver and lead solder on parts being bright nickel plated. Production hit a snag caused by frequent purification treatments. Four leading bright nickels had been tried to no avail. Then Unichrome Bright Nickel was installed. That did it. Its tolerance for impurities helped lick the problem. Work gets out on time now.

MORE TOLERANT BATH ...MORE WORK OUTPUT

A well known plant has been operating a tank of Unichrome Nickel alongside another type of bright nickel—both plating automotive and plumbing parts. Despite the fact that this other bath was a considerably larger installation, Unichrome Nickel turned out more work. Reason? Unichrome Nickel required fewer purification treatments—usually kept right on working while the other bath was shut down for purification. Unichrome Bright Nickel has now been installed in the larger tank.

Now you can finish it better and SAVE even more by going

during nickel controls...

BRIGHT NICKEL process

is now available to all

ALTHOUGH UNICHROME BRIGHT NICKEL is only now being made generally available, thousands of gallons have already been used to plate a wide variety of work . . . including brass, steel parts and intricate die castings. After 3 years of commercial operation, the Unichrome Bright Nickel process stands ready to deliver proved benefits to all platers now getting back to nickel plating production.

MORE DEPENDABLE OPERATION

This development of the United Chromium laboratories has simplified operations and reduced costs for the many companies using it.

Brighteners are unusually stable. As a result, fewer maintenance additions are required and costs are thereby reduced. Control of the three Unichrome addition agents —just two brighteners and an anti-pitter—is unsurpassed for simplicity. All addition agents being liquid solutions of highly soluble materials, maintenance additions are easily and quickly made and there are no problems from brightener drying on the work or crystallizing on tanks when the solution is cooled.

Another proved advantage of Unichrome Bright Nickel is excellent tolerance for contaminants, both metallic and organic. Need for purification treatments is reduced and much downtime is eliminated. Result: Still more economies and fewer operating problems.

With excellent tolerance for impurities and simple control, the Unichrome Bright Nickel solution is easily kept in prime plating condition. That means sustained brilliance of deposits, high rate of brightening, good leveling, and wide bright plate range.

SUPERIOR DEPOSITS

The Unichrome Bright Nickel process produces a brilliant ductile deposit that is whiter than usual—an advantage which gives subsequent chromium deposits an appearance of greater sparkle and makes chromium "misses" less obvious. Of even greater importance is the excellent receptivity of Unichrome Bright Nickel for chromium plate. In one operation bright chromium has been deposited *without activation* on Unichrome Bright Nickel deposits exposed to the air for as long as several hours. Having low internal stress, these nickel deposits show less tendency toward cracking in service, provide superior protection against corrosion for the basis metal.

You can install Unichrome Bright Nickel process easily and quickly. And since it uses a Watts type bath, you can easily convert your similarly based bright nickel to the Unichrome Nickel process and gain all of its benefits. Detailed literature is available at all offices of United Chromium, Incorporated.

UNICHROME Trade Mark **COATINGS for METALS**

UNITED CHROMIUM, INCORPORATED

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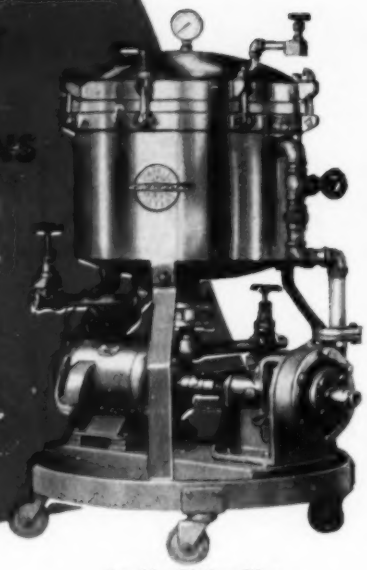
UNICHROME all the way

UNICHROME PYROPHOSPHATE COPPER | UNICHROME BRIGHT NICKEL | UNICHROME SRHS CHROMIUM

FOR LOW COST FILTERING OF PLATING SOLUTIONS

SPARKLER HORIZONTAL PLATE FILTERS



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

HERE'S HOW

★ On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

★ With the Sparkler horizontal plate you can apply this thin pre-coat evenly over the entire plate surface and start filtering immediately with less pressure and obtain maximum consistant clarity right from the start up to the end of the cycle.

★ A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

★ When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum of loss of valuable plating solution.

★ Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

★ At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

★ You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

MANUFACTURING COMPANY
Mundelein, Illinois

Sparkler International Ltd.
Prinsengracht 876, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill. U.S.A.

Personals

Harold R. Grutter has been appointed sales and service representative for the J. C. Miller Company, Grand Rapids, Mich. He will service the northern Ohio

Grutter

and southern Michigan territories. Grutter, who has wide experience in the metal finishing field, will make his headquarters in Toledo, Ohio.

Donald F. Garrigan has been named sales representative for the New York metropolitan area by Better Finishes & Coatings, Inc., Newark, N. J.

Garrigan

Previously, Garrigan was with C. J. Nickolas Co., Bellewood, Ill., as a technical representative in the finishing field. He also has been associated with American Airlines and Northwest Orient Airlines in maintenance operational planning. Since joining Better Finishes early this year, Garrigan has been employed in the laboratory on formulation, testing and application work.

Leslie B. Bellamy has been appointed general manager of the Sterling Abrasives division at Tiffin, Ohio by the Cleveland Quarries Company. The division is one of the nation's largest producers of artificial industrial abrasives.

Bellamy has been Detroit district manager for Sterling since 1946. He joined the division in 1944 as technical field engineer.

Elected national president of the American Society of Tool Engineers in March, 1952, Bellamy previously had served the 27,000 member organization as national first vice-president and national director.

A native of Wales, he came to this country in 1928 and joined the Packard

NEW PROTECTIVE COATING CHEMICAL FOR ALUMINUM

ALODIZING

Alodizing with "Alodine,"* a new technique in the protective coating of aluminum, was made available for production-scale use in 1946. Since that time Alodizing has largely supplanted the more elaborate, costly and time-consuming anodic treatments in the aircraft and other industries.

Continuous and successful industrial use has clearly demonstrated the simplicity and economy of the Alodizing process as well as the effectiveness of the "Alodine" amorphous coatings, particularly as a base for paint. In fact, the paint-bond that Alodized aluminum provides has been found to be superior to that possible with chromic acid anodizing.

The corrosion-resistance of unpainted aluminum Alodized with "Alodine" Nos. 100 or 300 is excellent, easily meeting the requirements of Specification MIL-C-5541. However, a need for protection of unpainted aluminum, even better than that obtained with chromic acid anodizing, has long been recognized.

NEW IMPROVED "ALODINE" DEVELOPED By ACP RESEARCH CHEMISTS

Several years of intensive research have now led to a new type of "Alodine," designated as "Alodine" No. 1200. This new protective coating chemical forms an amorphous mixed metallic oxide coating of low dielectric resistance that provides unusually high corrosion-resistance for unpainted aluminum. In addition, it forms an excellent paint bond that approaches closely the high quality obtained with the earlier types of "Alodine."

After having been tested for conformance with Specification MIL-C-5541, "Alodine" No. 1200 is now about to go into production.

PROCESS DETAILS

"Alodine" No. 1200 is the only essential chemical needed to prepare the coating bath and the final rinse bath. One of its unique features is that it can be used in tanks in an immersion process, or, in a multi-stage power washer in a spray process, or, with a slight adjustment of pH, with brush or portable spray equipment in a manual process. This means that even where the simple production equipment is not available, or where touching up of damaged coatings previously Alodized or anodized is required, excellent protection and paint bonding can still be obtained with practically no equipment.

All three methods of application easily meet the requirements of Specification MIL-C-5541.

Process sequence for all three methods of application is the same as for other standard grades of "Alodine" such as Nos. 100, 300, and 600, viz.: 1. Pre-cleaning. 2. Rinsing. 3. Alodizing. 4. Rinsing. 5. Acidulated rinsing. 6. Drying.

Coating time in an immersion process ranges from 2 to 8 minutes and in a mechanized spray process is about 30 seconds. "Alodine" No. 1200 baths are operated at room temperatures (70° to 100°F.) and heating is required only if the bath has gotten cold after a "down" period.

RECOMMENDED USES FOR "ALODINE" No. 1200

"Alodine" No. 1200 is specifically recommended for coating wrought products that are not to be painted or are to be only partially painted; and for coating casting and forging alloys whether or not these are to be painted. "Alodine" Nos. 100 and 300 are still recommended for coating wrought products such as venetian blind slats, awnings, etc., that are invariably painted.

RESULTS OF TENSILE TESTS

This new "Alodine" not only retards visible corrosion and pitting, but as shown in the table below, the loss of ductility with "Alodine" No. 1200, both brush and dip, after 1000 hours salt spray was less than for chromic acid anodizing after 250 hours, and for "Alodine" No. 100 and a conventional chromate treatment after 168 hours exposure.

PROCESS	SALT SPRAY EXPOSURE	COMPLIANCE WITH TENSILE REQUIREMENTS OF MIL-C-5541
CHROMIC ACID ANODIZING	168 hrs.	passes
	250 hrs.	passes
	500 hrs.	fails
	1000 hrs.	fails
BRUSH "ALODINE" No. 1200	168 hrs.	passes
	250 hrs.	passes
	500 hrs.	passes
	1000 hrs.	passes
DIP "ALODINE" No. 1200	168 hrs.	passes
	250 hrs.	passes
	500 hrs.	passes
	1000 hrs.	passes
DIP "ALODINE" No. 100	168 hrs.	passes
	250 hrs.	fails
	500 hrs.	fails
	1000 hrs.	fails
CONVENTIONAL CHROMATE TREATMENT	168 hrs.	passes
	250 hrs.	fails
	500 hrs.	fails
	1000 hrs.	fails

*"Alodine" Trade Mark Reg. U. S. Pat. Off.

CHEMICALS ACP PROCESSES

AMERICAN CHEMICAL PAINT COMPANY

General Offices: Ambler, Penna.

Detroit, Michigan ***Niles, California*** ***Windsor, Ontario***

Personals

Motor Car Company as materials specifications supervisor. Later he was chief tool research engineer for the automotive firm.

Roy D. King and **Marcel Zinty** were elected vice-presidents at the recent annual meeting of the Board of Directors of the Magnus Chemical Company, Inc., Garwood, N. J.

King, who has been manager of the railroad division of Magnus for the past 5 years, was made vice-president in charge of railroad sales and development.

Zinty, who before coming to Magnus as manager of the equipment division, was chief engineer of Mabor and Company, Paris France, was made vice-president and general manager of the equipment division.

Joseph J. Schaefer and **Francis B. Bryant** have been appointed sales engineers in Udylite Corporation's Chicago regional sales office.

Schaefer **Bryant**

Schaefer, formerly with Parke, Davis & Company, Detroit, is assigned to Chicago's northside sales district. A member of the American Chemical Society, he was graduated from the University of Detroit with a Master of Science degree in Chemistry.

Bryant's new headquarters are at Battendorf, Iowa. The district includes western and southern Illinois, Iowa, and Nebraska.

He is a graduate of Albion College, Albion, Mich., and was associated with the Provident Mutual Life Insurance Company before joining The Udylite Corporation.

Promotions of six staff personnel at Frederic B. Stevens, Inc., were announced by **W. J. Cluff**, president of the plating and foundry supply firm.

Watt **Eastman**

Frank Watt, new general sales manager for the metal finishing and foundry divisions, formerly was sales manager for the metal finishing division. He joined Stevens in 1934 as a sales engineer.

Guy Cummings, an electrical and sales engineer, takes over Watt's former post. **Clair Crawford,** a service engineer, has been named sales manager for the foundry division.

Ralph L. Eastman, new consultant on all metal finishing operations, formerly was manager of the buffing composition department. **Durwood J. Swaninger,** formerly assistant manager of the buffing department, has been named sales manager of buffing compositions.

Dr. J. A. Ridderhof, formerly manager of the foundry facing department, has been appointed manufacturing manager and director of research for the foundry facing and buffing composition departments. He has been with Stevens for 26 years.

N. F. Diederich has been appointed Manager of Engineering by the Electric Products Company, Cleveland, Ohio.

After graduating from Case Institute of Technology in 1932 with a B.S. in Electrical Engineering, Diederich spent seventeen years with The Clark Controller Company where he last served as Manager of Engineering Standards. He has long been active in AIEE affairs, having served the Cleveland Section as Chairman of the Motor and Control Group and Technical Chairman of the Technical Group Committee. At present he is a member of the Professional Status and

Satisfactory Deburring in Noah's Time...

BUT NOT IN 1954!

When you use the right deburring compound in a tumbling setup, you not only cut the *time* required for the removal of burrs by incredible margins . . . but you get far more accurate results, with a tremendous reduction in rejects.

Magnus Deburring Compound virtually eliminates hand labor, yet keeps the metal removal right down to the burrs without affecting the pieces themselves.

Ask us to send complete details on up-to-date deburring with Magnus Deburring Compound.

magnus

MAGNUS CHEMICAL CO., INC.
41 South Ave., Garwood, N. J.
In Canada: Magnus Chemicals, Ltd., Montreal
Service Representatives in Principal Cities

Registration Committee. Also he is a registered Professional Engineer in the State of Ohio.

Linden C. Watkins, for several years foreman of the plating and hardening division of the Remington Rand, Inc., plant in Elmira, N. Y., is now the Oakite Products, Inc., representative in Nassau and Suffolk Counties, Long Island, N. Y.

Watkins

Krajicek

R. W. Krajicek, formerly with the Phillips Petroleum Co., and a graduate in chemical engineering from Gonzaga University, is now representing Oakite in the state of Montana.

Newey

Joseph M. Newey, a graduate of the University of Utah, has been assigned to serve metal accounts in the Salt Lake City area.

Felis W. Saco has been promoted to the position of Development Engineer by the Permutit Company, New York, N. Y.

Saco joined Permutit in September, 1952 and was assigned to the Mechanical Engineering Department to work on the design and improvement of household water softeners. He attended New York University, receiving a Bachelor's degree in Mechanical Engineering in 1940. Saco is a member of the ASME and the Technical Association of the Pulp and Paper Industry.

Steve Yacus has been elected to the position of Secretary-Treasurer of Metal Finish, Inc., Newark 5, N. J., distributors for Minnesota Mining and Manufacturing Company's "Honite" barrel finishing abrasive chips, compounds and equipment.

A native of Newark, Yacus is a graduate of General Motors Institute, Flint, Mich., B.S. (M.E.) 1944, and in 1948 completed post graduate work receiving the degree of Bachelor of Industrial Engineering from

Yacus

the same institution. He was with Buick-Oldsmobile-Pontiac Division, General Motors Corp., at Linden, N. J., Wilmington, Del., and Atlanta, Ga., as superintendent of metal finishing until 1949 and most recently was employed as sales engineer by Almco Division, Queen Stove Works.

O. E. Anderson has been appointed to the technical staff of Continental-Diamond Fibre Company, Newark, Del. A specialist on materials used in electrical insulation, including laminated plastic products and flexible coated fabrics, Anderson will function as technical service representative for the company's plastic flexible sheet and tape products.

A graduate of Carnegie Institute of Technology, Anderson gained authoritative experience with electrical insulation through more than 24 years in the Micarta Division of Westinghouse Electric Corporation at Trafford, Pa. He has been active on committees of the ASTM and NAM concerned with technical problems in the field of electrical insulation.

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Special ratio materials for plating richlow brass or any other desired alloy of copper and zinc.

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Trade Literature

L—100. Neoprene 100—Through special formulation, it is now possible to eliminate the 10 to 20 coat systems formerly required to line tanks with Neoprene. Brush coats 10 to 20 mils can be applied, so that 1/16 inch linings can be obtained with 4 to 7 coats. There is no loss of physical or corrosion resisting properties, and coatings cure at room temperature.

The new coating is called Neoprene 100. Its physical properties and corrosion resistance are described in a bulletin, issued by the Carboline Company, 331P Thornton Ave., St. Louis 19, Mo. The bulletin also gives recommendations for various services and thoroughly describes application by brush or spray. For your copy, use Reader Service Card.

L—101. Vapor Degreasing Manual—The Circo Equipment Company, 120 Central Ave., Clark (Rahway), N. J., has compiled a comprehensive work on the subject of vapor degreasing which is felt to be the most complete volume to date on this important phase of metal cleaning.

Circo's Vapor Degreasing manual comprises 34 pages of detailed information ranging from a description of degreasing processes to maintenance and trouble-shooting. The volume is fully illustrated with diagrams and cutaway photos.

There is a complete section on installation of equipment, with a description of problems encountered and how to meet them.

Special attention is given to maintenance of equipment, "trouble-shooting" and servicing. Solvents are also discussed in detail, as well as types, usage and operation of solvent recovery stills. A copy of the manual may be obtained by using Reader Service Card.

L—102. Ultrasonic Cleaning Bulletin—How the ultrasonic generator works, the principles of high-frequency sound cleaning, and examples of present applications are explained in a new bulletin announced by the General Electric Company, Schenectady 5, N. Y.

Designated as GEA-6056, the 2-color, 4-page publication explains how the ultrasonic action of the generator hastens cleaning by as much as 100 times. Photographs and drawings show components of the equipment and the generator in use. For your copy, use Reader Service Card.

L—103. Blast Cleaning—This new booklet issued by the Pangborn Corporation, Hagerstown, Md., aims at explaining abrasive cleaning in a new way. Its purpose is to supply nontechnical information to anyone who would like to know more about the possibilities of blast cleaning in his field.

The economics of blast cleaning are discussed in terms of the type of surface to be cleaned, finish required in a specified time, and the price per piece cleaned with lowest possible maintenance cost.

From this point, the book goes on to present the advantages of various types of blast cleaning machines for specific uses. Abrasives are treated in terms of part to be cleaned, finish, and cost.

A comprehensive list of applications is furnished along with a glossary defining the terms used in the book. For your copy of this informative booklet, use Reader Service Card.

L—104. Precision Barrel Finishing Handbook—Lord Chemical Corporation, 2068 S. Queen St., York 9P, Pa., has issued a 32-page handbook and catalog on "Lorco" compounds for descaling, deburring, abrasive cutdown, nonabrasive cut-down, finishing, coloring, burnishing, metal cleaning and rust inhibiting.

Twenty standard compounds and three special purpose compounds are described in detail. A rapid application index serves to give the reader a quick reference to the particular standard and special purpose compounds recommended for various applications. A series of 24 unretouched "before and after" photographs show the results accomplished by "Lorco" compounds. For your copy of the handbook, use Reader Service Card.

L—105. Two-Drum Tumbling Barrel—Tumbling Sales & Service Company, Greenwich, Conn., announces a new catalog describing the only two-drum tumbling barrel to eliminate overhung loads

SEL-REX builds the world's largest single cubicle Selenium Rectifiers — up to 50,000 amperes — completely sealed and water cooled for absolute protection against dust, dirt and corrosion. Large single cubicle units, that will fill any D.C. power requirement, are another engineering accomplishment of the same company which originally developed completely protected rectifiers designed to withstand highly corrosive atmosphere.

There is a Sel-Rex Selenium Rectifier for every plating purpose, from 25 to 50,000 amperes. Regardless of size or type, all of them incorporate the features that make Sel-Rex the foremost name in D.C. power — top efficiency, long life and low maintenance costs, even under the most rugged plating conditions.

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Pioneers and Builders of Time Tested COMPLETELY SEALED Plating Rectifiers

Without obligation, write for a copy of "Plating Power" or have our technical representative call to discuss your specific requirements.

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It took specialized "know-how" to conceive and create the first patented Bias Sisal Buff! And that same knowledge has been steadily enlarged and improved by the ablest, most experienced staff in the business—concentrating on this type of buff. Today, our modern, efficient plant proudly produces buffs that meet the most exacting requirements of the metal finishing industry. Always insist on original quality. Specify JOE-D—America's finest Bias Sisal Buffs.
The JOE-D line covers a complete selection of Bias, Bias Spoke (Finger), and Conventional Buffs — as well as quality Polishing Wheels.
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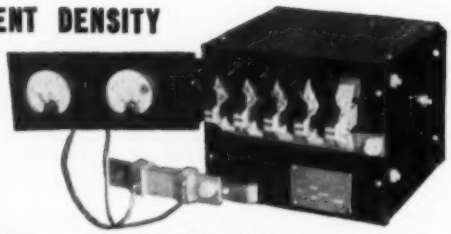

It's easy to adjust your tank voltage to suit the load with a Cast Grid Type Columbia Tank Rheostat. Standard sizes from 15 to 5000 Amperes, 1 to 6 Volt drop. Other voltage drops as specified.

COMPARE THESE OUTSTANDING FEATURES

- Cast Grid Resistors, rugged and resistant to chemical fumes.
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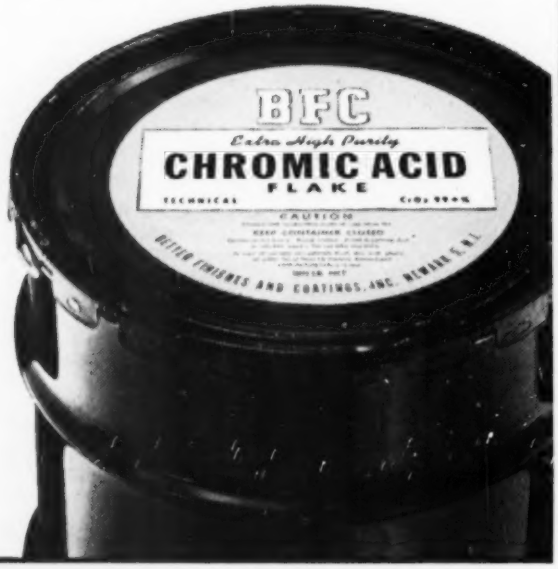
The top label says "Extra High Quality" and that's what every drum contains. We think you'll like the uniform quality of our product and the way we make good on our promises. When you're in the market, why not call us?



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Trade Literature

by providing outboard bearings. This is only one of its many exclusive features.

Also detailed in the catalog are Esbec Color Identified Barrel Finishing Compounds which bring modern color identification to the tumbling room for the first time. For your copy of this descriptive literature, use Reader Service Card.

L—106. Industrial Inferential Meter—A colorful and information-packed bulletin, describing the Type MO Meter, has been prepared by the Simplex Valve and Meter Company, 68th and Upland Sts., Philadelphia 42P, Pa. This 16-page bulletin contains data on operation, construction, accuracy, primary devices and other general information of interest to power, process and sanitation engineers who deal with fluid flow problems.

The Type MO instrument is perhaps the most accurate Venturi type meter now available. It provides a means of obtaining very accurate measurement of fluid flows over remarkably wide ranges and is designed for water, sewage, sludge and industrial liquors. For your copy of the bulletin, use Reader Service Card.

L—107. Catalog Describes Keys and Switches—Complete information about keys and switches supplied by Leeds & Northrup Company, 4934P Stenton Ave., Philadelphia, Pa., for use in industrial or laboratory applications is furnished in a new 12-page catalog, "Keys and Switches", just published.

Included in this catalog are photographs and line drawings illustrating the design features of the keys and switches. To facilitate selection of switches, necessary dimensions and mounting directions are given. For easy reference, all specifications are arranged in tables. For your copy of this literature, use Reader Service Card.

L—108. Process Equipment Bulletin—Facilities for the custom fabrication of process industry equipment in standard and special alloys are outlined in a new bulletin released by Quaid Fabrications, Inc., 161 W. Oxford St., Philadelphia 22, Pa.

In addition to covering the ranges of products produced by their fabricating and heat exchanger divisions, the bulletin gives actual data on sizes and types of all production equipment, productive capacity, transportation facilities and other information of interest to purchasers and specifiers. For your copy of the bulletin, use Reader Service Card.

L—109. Water Filter Catalog—In response to requests from all branches of industry, Marvel Engineering Co., 625 W. Jackson Blvd., Chicago 6P, Ill., makers

of synclinal filters, have recently adapted all models of their sump and line type filters for water applications. No changes have been made in the basic synclinal design.

Maximum active filter area, longer periods of operation, no moving parts, simplicity of maintenance and other outstanding features that have earned overwhelming preference for Marvel synclinal filters in the filtration of oil in hydraulic and low pressure liquid circulating systems have been retained.

Full details are presented in a new catalog, copies of which may be obtained by using Reader Service Card.

L—110. Specifications for Thermometers—Recommended specifications for fractional degree and general laboratory grade thermometers have been released by Scientific Apparatus Makers Association, 20 N. Wacker Dr., Chicago 6, Ill.

The Glass Thermometer and Hydrometer Committee of the Industrial Instrument Section of this group will furnish copies of Specifications for Thermometers to readers, without charge. Write to the SAMA, or use Reader Service Card.

L—111. Long-Scale Switchboard Instruments Bulletin—A new 24-page bulletin on long-scale switchboard instruments has been announced as available from the General Electric Company, Schenectady 5, N. Y.

Designated GEC-218C, the publication contains a description of the company's AB-DB-18 and AB-DB-16 instrument lines as well as principles of operation, characteristics, and specifications. Prices and dimensions also are provided. For your copy, use Reader Service Card.

L—112. Filter Bulletin—A new bulletin describing The Murray-Way filter has been issued by The Murray-Way Corp., Box 180P, Birmingham, Mich. It describes a revolutionary advance in modern industrial filtration that gives advantages of automatic, economical, efficient, self-cleaning, compact and adaptable operation. Technical details on the operation of the new filters are given along with a table of screen sizes. For your copy of this bulletin, use Reader Service Card.

L—113. Vapor Degreaser Catalog—A new catalog on vapor degreasing has been released by Currier Company, Inc., 710P 73rd Ave., Oakland 4, Calif. The catalog includes information on degreasing and shows their standard sizes as well as the low cost "Drum Major" line. Also included are special degreasers designed for specific jobs. The catalog is illustrated with typical examples of these units including specifications. For your copy, use Reader Service Card.

it's lighter in weight

it operates in more plating solutions

it hangs deeper in all tanks

it's the new...

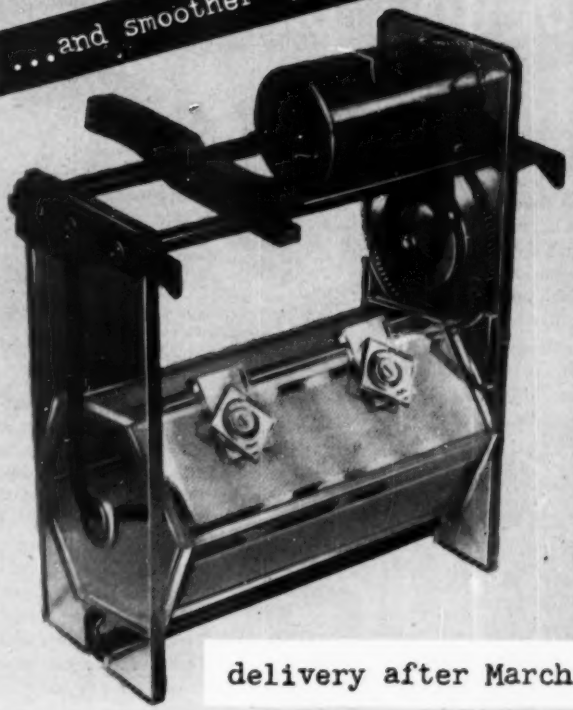
portable

"LAZO" 2CP6 54

...with "MULTI-MESH" drive

...for longer gear life

...and smoother operation



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Originators of Ribless Plating Barrels

Equipment and Supplies

E—114. Copper Cyanide Plating Addition—Lea-Ronal, Inc., 44 27th St., Long Island City, N. Y., announces the release, for precision and commercial copper cyanide plating purposes, of Supertartral, an additive that offers distinct operating values over Rochelle Salts and other tartrates, resulting in better, faster, and more economical plating. Supertartral provides: (a) superior anode corrosion; (b) greater solution tolerance to numerous metallic impurities; (c) better deposits with less tendency to roughness; (d) reduction in operating costs when used at recommended concentration; (e) better cyanide stability.

Lea-Ronal Supertartral has been thoroughly tested in production volume in all methods of plating. Free samples for laboratory testing purposes can be obtained on request from the manufacturer. Use Reader Service Card.

E—115. New Electric Radiant Element for Industrial Oven Heating—An entirely new type of electric radiant heater, said to emit rays in the far-infrared field, has been developed by Cleveland Process Co., 1965 E. 57th St., Cleveland 3P, Ohio.

According to the manufacturer, a single heating unit consists of a fused quartz tube, 48 inches long, in which is encased a heavy duty nickel-alloy heating element. The element is completely sealed and supported its full length inside the rigid quartz body and cannot sag, warp or stretch and cause short circuiting. The fused quartz tube is acid-proof; vapors cannot enter and deposit carbons that might result in shorts and heater failure.

Each heating element has an individual stainless steel reflector in which it is firmly secured by a supporting and connection bracket at each end. Radiant heater panels and assemblies are made up from multiples of these units. Capacities of individual units range from 100 to 1000 watts per linear foot. For more information, use Reader Service Card.

E—116. Jet Plater Features Unique Agitation Method—All of the necessary equipment for mass production plating of precious metals or small scale laboratory pilot plant operations is combined in the new portable Jet plater now being marketed by Sel-Rex Precious Metals, Inc., Belleville, 9P, N. J. Also incorporated in the new unit is a unique "jet" agitation action, a first-time feature in any small-volume plating unit.

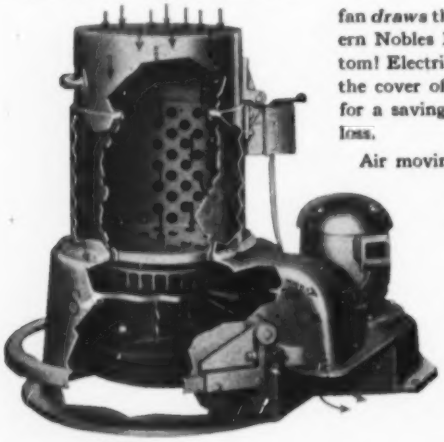
The unit can be furnished with a rubber-lined or Koroseal tank for use with acid solutions. It is ideally suited for still plating, or it can be fitted with a portable barrel for barrel plating operation.

Completely automatic in operation, the Jet plater consists of a selenium rectifier with an automatic timer, of the proper output rating for the tank size; a stainless steel tank, which can be used as the anode, with a water compartment for

Is Your Dryer A BUCKING BRONCO?

In order for a centrifugal dryer to stay put it should be heavy. That's why the modern Nobles Dryer is about twice the weight of most dryers. Extra weight is one of the reasons for its stability, its freedom from vibration, its smooth operation, and long trouble-free life.

It's all new in design and principle. A powerful suction fan *draws* the air completely through this modern Nobles Dryer and exhausts it at the bottom! Electric or steam heaters are mounted in the cover of this machine of advanced design for a saving of space and elimination of heat loss.



Air moving equipment isn't an extra. The powerful suction fan is an integral design feature of each machine. A brake pedal extending around the entire work area controls an internal, expanding hydraulic brake for quick, smooth stops.

Why not take the first step now toward modern quick drying and lowest costs?

NOBLES ENGINEERING & MANUFACTURING CO.

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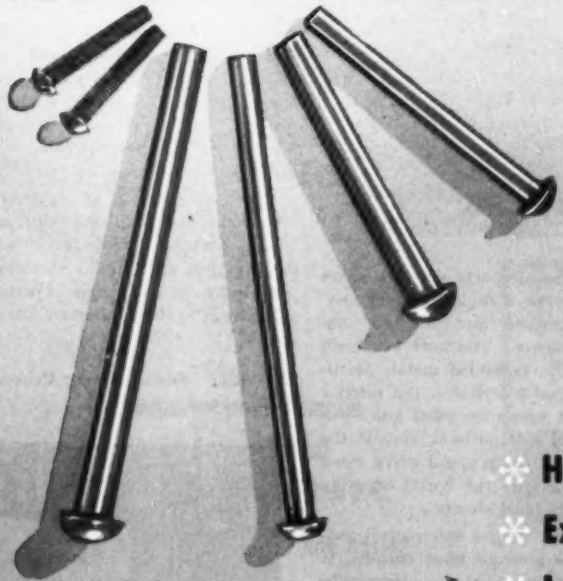
Write Today for the FREE NOBLES DRYER BROCHURE

TWO NEW
Barrel Zinc Brighteners



B-4...B-4M

with

- ✲ **High Brilliance and Depth of Color**
- ✲ **Excellent Covering and Throwing Power**
- ✲ **Low-cost Operation**

. . . simple, economical methods for producing brilliant zinc deposits on barrel work. These Promat processes will last longer and cost less to use.

Promat B-4 and B-4M Brighteners have been fully proven in production. Several large barrel plating companies have been using them for months with great success.

The average cyanide zinc plating solution can be converted relatively easily to either of the Promat Barrel Zinc Brightener Processes. For full details just drop a line to Promat. Our service organization is ready to serve you at any time, on any plating problem.

PROMAT
DIVISION

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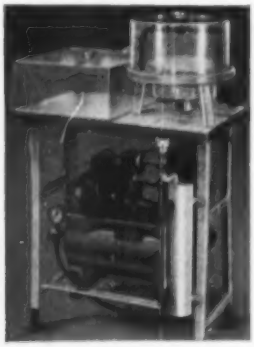
Equipment and Supplies

temperature control; a movable work rack, which will accommodate a portable plating barrel; a corrosion resistant, stainless steel filter; a polyethylene, drip-proof pump powered with a ¼hp motor; and a "safety" tank under the plating tank, pump and filter to catch leakage or accidental spillage.

Agitation is accomplished with a "jet" arrangement at the bottom of the tank which produces continuous rapid movement of the solution. For further information, use Reader Service Card.

E—117. Lucite Salt-Spray Tester—Convenient observation of salt-spray corrosion tests is achieved through machines with Lucite testing compartment and salt solution reservoir developed by Belke Manufacturing Company, 947 N. Cicero Ave., Chicago 51P, Ill.



Designed for laboratory use, as well as for running small parts and samples, the machine is completely self-contained and attractively finished.

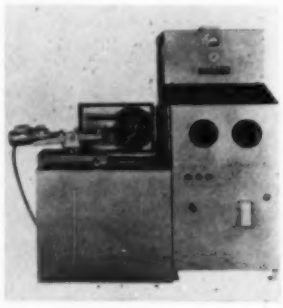
The salt-spray testing compartment is approximately 13½ inches diameter x 8 inches high. For more information on this unit, use Reader Service Card.

E—118. Hull Cell for Baths Operated at Elevated Temperatures—R. O. Hull & Company, Inc., 1300P Parsons Court, Rocky River 16, Ohio, announces the Model "WT" Hull Cell, the latest development in Hull Cells which provides a simple and accurate method for control of plating baths operated at elevated temperatures.

According to the manufacturer, the complete unit consists of a Lucite Hull Cell mounted with a waterproof, variable-control thermostat (containing a pilot signal light). This is connected in series with a 110 volt (ac or dc) quartz immersion heater located in the base of the unit. Thermostat automatically controls temperature at plus or minus 3° F. The new cell uses the same size cathode as the 267 ml unit. For more information on this new control equipment, use Reader Service Card.

E—119. Wet-Blasting Equipment—The addition of a new model to its line of wet-blasting equipment has been announced by the Cro-Plate Co., Inc., 747P Windsor St., Hartford, Conn.

Known as the pressure blast roto-barrel, this unit was designed for the bulk, high-production rate finishing, cleaning or



deburring of small parts such as screw machine products, stampings, small castings and extrusions and precision machined components. The work is merely loaded into the expanded metal, plastisoled barrel and rolled into the interior of the cabinet where the blast gun, in a fixed but adjustable position, aims in the open end. A variable speed drive rated at 0–78 rpm rotates the barrel exposing the parts to the blast stream.

Because of its unique, extremely versatile design, the pressure blast roto-barrel unit may also be used as a manually operated machine. Armports and knee-actuated triggers are provided so that the operator standing outside the cabinet may manipulate and actuate the blast gun which, while fixed for the barrel operation, is easily removable. For more data on this equipment, use Reader Service Card.

E—120. Vinyl-Base Cement—The Atlas Mineral Products Company, Mertztown, Pa., announces the availability of Vitroplast, a new vinyl base chemical resistant cement which is completely resistant to hydrochloric acid, phosphoric acid, 60 per cent sulfuric acid, 5 per cent nitric acid, 5 per cent chromic acid, sodium hypochlorite, benzene, gasoline, and chlorine dioxide at temperatures up to 150° F.

Unlike standard chemical resistant resin cement, Vitroplast does not require acid or alkaline setting agents and will set in contact with concrete or steel and under adverse conditions. It has a working time of approximately 40 minutes and a setting time of less than 2 hours at ordinary temperatures and is available as a white bleach-resistant cement. For more data on this product, use Reader Service Card.

E—121. Quick-Detachable Swivel Air Connection—A new, compact, quick detachable air connection, said to provide almost complete free flow of air to air-powered tools, is announced by the Binks Manufacturing Co., 3122P Carroll Ave., Chicago 12, Ill. This new Q-D connection, which is recommended for the air hose coupling on paint spray guns and other air-operated equipment, slashes pressure drop at the connection to only 5 per cent. The important significance of this fact, the maker points out, is that repeated laboratory tests on other standard quick-detachable connections show pressure drops at the connection "bottleneck" ranging from 21 to 57 per cent.

Another advantage claimed by the manufacturer includes full 360-degree swivel action. No longer must the operator twist the air hose, which is difficult when the hose is under pressure. The spray gun or other tool can be rotated on the base to bring it into position.

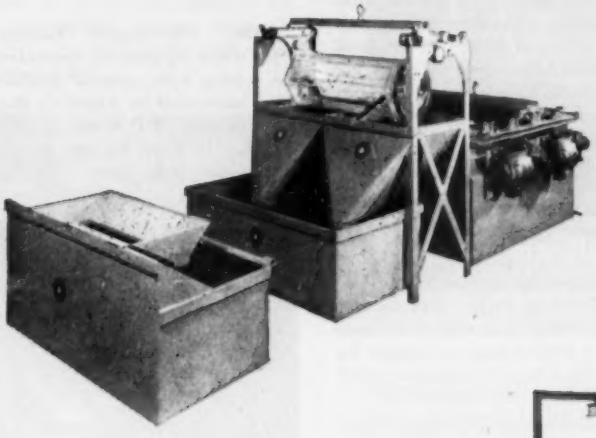
The ease and speed of operation with the new connection saves time and effort. It is considered particularly useful with spray guns when quick color changes are made by changing guns. For more information, use Reader Service Card.

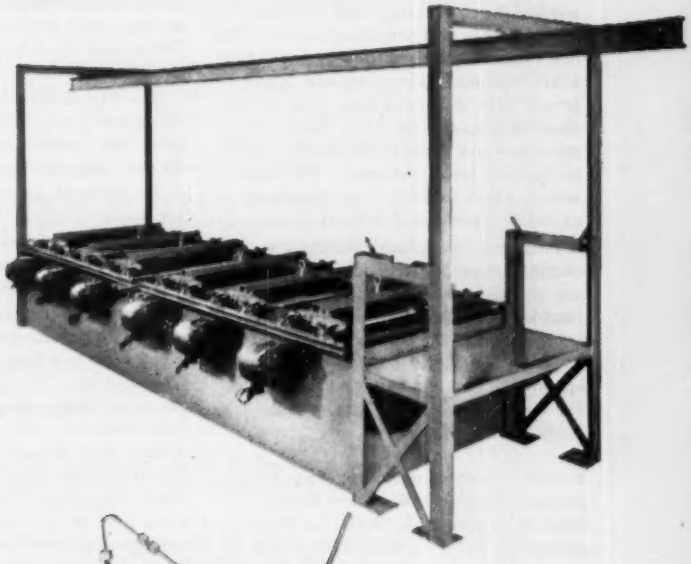
E—122. Sonicleaning Process Demonstrated—(see photo).

First public demonstration of a fully conveyorized production model Soniclean machine, which applies ultrasonic energy to precision metal cleaning, was made by the Detrex Corporation of Detroit at the recent National Metal Exposition in Clereland. The Soniclean machine, using a trough-type barium titanate transducer directly immersed in a degreasing solvent, generates particle acceleration to 1,500,000 times the force of gravity in the focal region, producing superlative cleaning results

In the photo, Dr. William L. McCracken (left), Detrex's director of research, discusses a technical point with Detrex's ultrasonics specialist, Donald Johnson. For more information on the process, use Reader Service Card

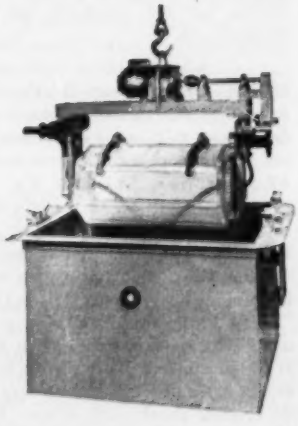
CROWN PLATING BARRELS

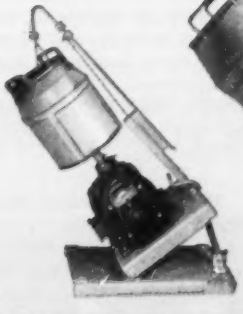




For superior performance there's a Crown Barrel Plating Machine for the job.

A size and type for any barrel plating application.





Write for complete Barrel Machine Catalog

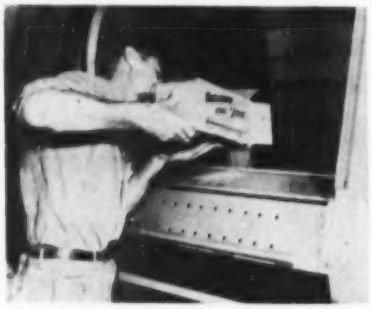
CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

INDICATE A 130.

Equipment and Supplies

E—123. Packaging, Shipping Developments—American Wheelabrator & Equipment Corp., 1180 S. Byrkit St., Mishawaka, Ind., has announced a new



method for packaging and shipping its blast cleaning and peening abrasive. The new packages consist of 50-pound fiber board cartons. These replace the 100-pound bags that have been used by the abrasive industry for many years. Shipments are now made on disposable pallets holding one ton of shot each. The palletization, which formerly was considered as an extra, is performed without charge.

From an operational standpoint, the cartons are easier to handle when charging any type blast cleaning or peening machine. Only half the weight of the conventional bag, the carton is easily lifted up to the abrasive charging point and operator strain and fatigue are reduced. For more information on this product use Reader Service Card.

E—124. Corrosion Protecting Compound—Barcote 600, a new leaded petroleum compound developed for the protection of metal surfaces against corrosion, has been introduced by the Brooks Oil Company, 934P Ridge Ave., Pittsburgh 12, Pa. This material is recommended for corrosion protection of structural steel and sheet metal, protection of metal parts in storage.

It may be applied by either brush or air spray. A solvent, cut-back, leaded compound, it provides coverage with a thin film which sets to a semi-hard coating of pure lubricant—with adhesion and penetration of all metals. Since the film is semi-hard and rubber-like in nature, it expands and contracts without flaking, cracking, pulling away, blistering or failing. For additional data on this product, use Reader Service Card.

E—125. Non-Breakable Drums—New non-shattering polyethylene drums for shipping industrial acids and bulk chemicals whose light weight reduces shipping costs by an estimated 40 to 50 per cent are produced in capacities of 5, 15, 30 and 55 gallons. The tough new containers are classified as drums by the Interstate Commerce Commission. The giant 55-gallon drums, said to be the largest container ever molded of polyethylene, holds as much as four 13½-gallon conventional glass carboys but weighs only about one-fifth as much and may be lifted with one finger. The flexible drums are designed to fit standard fiber, plywood and steel overpacks. Cost of the drums is as much as 40 per cent lower than units made of other materials, according to Delaware Barrel & Drum Company, P. O. Box 1648P, Wilmington, Del., which developed them. The new drums resist industrial acids such as muriatic and hydrofluoric, caustic soda solutions and electrolyte fluid. For more information on this product, use Reader Service Card.

E—126. Improved-Design Vapor Degreaser—The first major improvement of vapor degreasing equipment to be made in more than twenty years is claimed by Metalwash Machinery Corporation, 901P N. Elizabeth Ave., Elizabeth 4, N. J.

The Metalwash improved design vapor degreaser incorporates features often desired but never available in the past. These include: obstruction free tank walls, recessed condensing coils, removable pump chamber and water separator manufactured of solid stainless steel, one end maintenance and demand type control of water into the water condensing system.

The condensing coil commonly located around the interior walls of a vapor degreaser has now been recessed into a back compartment. The over-size water separator and pump compartment have been fabricated of solid stainless steel and welded to a flanged plate to permit removal of the complete unit to permit periodic inspection of the storage tank interior. All service connections and clean-out openings are located at one end of the tank, making a neater installation and simpler maintenance. The automatic water temperature regulator is so installed that maximum water is required only at times of maximum heat input, when no work is being cleaned. This reduces water consumption as much as 75 per cent. For additional data on this equipment, use Reader Service Card.

E—127. Hydraulic Honing Machine—The Hydro-Hone Manufacturing Co., 6829P Rita Ave., Huntington Park, Calif., has introduced a new hydraulic honing machine. The new unit offers a greatly improved process for the liquid-abrasive cleaning and polishing of all metal parts.

Incorporating a number of revolutionary design changes, Hydro-Hone engineers have made it possible to increase finish appearance and accuracy, speed production, and greatly decrease upkeep costs. Among the many exclusive new features is the automatic drain which promises a 300 per cent faster changeover from one abrasive to another. Operators are assured exceptional blast chamber visibility through an increase in illumination to 1200 watt brilliance, and a new blower system that completely changes interior air every three seconds. For more data on this equipment, use Reader Service Card.

E—128. All-Purpose Tubing—Ace-Flex, a new all-purpose, transparent plastic tubing with unusual flexibility, has been announced by American Hard Rubber Company, 93P Worth St., New York 13, N. Y. Ideal for any temporary or permanent fluid lines where easy-to-

handle, sturdy, flexible tubing is required, Ace-Flex is inert, odorless, nontoxic, and ages well. It is highly resistant to most inorganic acids and alkalis, and is resistant to many organic chemicals.

The smooth, shiny, nontacky finish of Ace-Flex permits quick and easy cleaning, and it may be steam sterilized. It is light in weight, abrasion-resistant, and retains its clear transparency through long life. For a sample and more information on this product, use Reader Service Card.

E—129. Paint Spray Booth Shield—A product for greater efficiency and reduced costs in cleaning paint spray booths has been announced by Thompson & Co., Allegheny Ave., Oakmont, Pa. Designated as "spray booth shield", the substance protects the inner surfaces of spray booths as well as turntables and stands so that when paint overspray accumulates it may be removed easily and quickly. "Spray booth shield" is of a paste-like consistency and is milky-white in color. It can be applied to any surface by brush, trowel or knife. Since it always retains its original consistency it may be used, after application, in either of two ways. First, it may be covered by any common type of paper. Then when paint overspray builds up the paper can be stripped and new paper added. Or, if desired, the shielding material can be used alone, so that overspray strikes it directly. Then, after paint accumulates, both paint and the shielding can be removed easily with

a scraper or putty knife. As no waiting or drying time is required, booths can be used immediately after application of the material. For more information use Reader Service Card.

E—130. Method of Sealing Microporosity in Castings—L. O. Koven & Brother, Inc., 156P Ogden Ave., Jersey City 7, N. J., has recently completed fabrication of special impregnators for sealing microporosity in cast electronic and aircraft parts with styrene base material, varnish or wax.

The simple process works as follows: Castings are loaded into baskets which, in turn, are lowered into the vacuum chamber of the impregnator. The chamber is evacuated, the castings being thoroughly de-aerated prior to impregnating.

Impregnating solution is next pumped into the tank. Pressure of 100 lbs/sq in is then applied and maintained long enough to assure full, deep penetration of the castings by the solution. After impregnation is completed, excess solution is flushed out through piping in the bottom of the tank. For more information on this process, use Reader Service Card.

E—131. Plastic-Metal Laminating Method—A method of laminating vinyl plastic and sheet steel or aluminum which will make these metals colorful, decorative and permanently rust and corrosion proof has been developed by the Naugatuck chemical division, United States Rubber Co.

The process combines the structural strength of metal with the bright colors and exceptional corrosion resistance of vinyl plastic. It promises to be one of the most significant advances for the metals and plastics industries in the last decade, the company believes.

More than 20 manufacturers of containers, business machines, chemicals, metals and allied products are now experimenting with the process.

Some of the products which can be made from the plastic-metal laminate are decorative and weatherproof building siding, office and industrial machine housings, inexpensive corrosion resistant containers for chemicals and chemical piping and ducts.

The resulting plastic-metal laminate

a special message for
manufacturers of aviation equipment
need a finish for
light metal parts?
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Here's the finish that combines corrosion resistance and paint adherence with extreme ease of application. It can be welded or soldered with no difficulty and presents no problem in "patching" scratches, marks or scraped sections. Here's what you can do with Iridite:
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ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.
AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.
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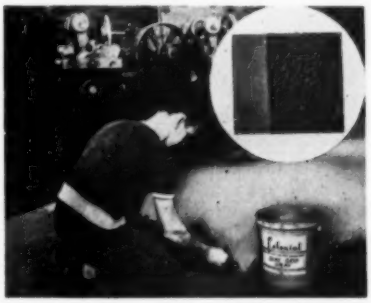
has a higher abrasion resistance than varnish, paint and baked enamel finishes. In addition, the bond of the plastic to the metal is so strong that 180 degree bends and deep draws can be made without separating the vinyl from the metal. The cost of the laminate is higher than galvanized iron, but only about one-third the cost of comparable gauge stainless steel. For more information on this product, use Reader Service Card.

E—132. Colloidal Graphite Keeps Bearings Rolling at 600° F—"Frozen" bearings in the wheels of overhead oven conveyor trolleys caused continuous trouble at Simmons Company, Elizabeth, N. J., manufacturers of world-renowned mattresses. The bearing retainers roll into tempering ovens operating at 600° F and paint-baking ovens at 300° F. Ordinary lubricants tend to decompose or burn-off at these high temperatures. It

has been found that Acheson Colloid Company's "Oildag", a dispersion of colloidal graphite in oil, is a lubricant unaffected by the temperatures required in their process and therefore successful.

The finishing operation is manual. Operators push box springs, attached to the trolleys, into the oven for oil burn-off and spring tempering. The spring assemblies are then removed from the oven, dipped in paint and returned to it for 15 minutes at 300° F. For more data on this lubricant application, use Reader Service Card.

E—133. Safety Floor Coating—A brand-new development in quickly and inexpensively removing the skid and slip from hazardous floor areas is Sure Grip, the safety coating marketed by Colonial Refining & Chemical Co., NBC Building, Cleveland 14P, Ohio.



Sure Grip is an abrasive-filled plastic coating which brushes on like a paint in one simple application, and then stays on the safe-proof danger areas for it is actually 20 times the thickness of a conventional two-coat paint job. It was originally designed for use by the Armed Forces, and has been adapted by many industrial concerns to eliminate costly spills and falls. It dries in 10 hours; resists gasoline, oil, alcohol and water; can be used over wood, metal or concrete; and comes in two colors, red or gray. For further information on this product, use Reader Service Card.

E—134. Soluble Silicate Products—The Philadelphia Quartz Company, Public Ledger Building, Philadelphia 6P, Pa., announces the addition of two new products to its line of soluble silicates—anhydrous sodium metasilicate and sodium orthosilicate, known as Metso Anhydrous and Metso 200.

Metso Anhydrous is technically pure anhydrous sodium metasilicate (Na_2SiO_3). It is a strongly alkaline detergent used for heavy-duty cleaning in the metal industries, and for formulating specialized detergent compounds.

Metso 200, highly concentrated sodium orthosilicate, is designed for cleaning operations that require extra strong alkaline activity. It is suggested for the cleaning of ferrous metals prior to electroplating and enameling as well as for soaker tank cleaning. For more data on the products, use Reader Service Card.

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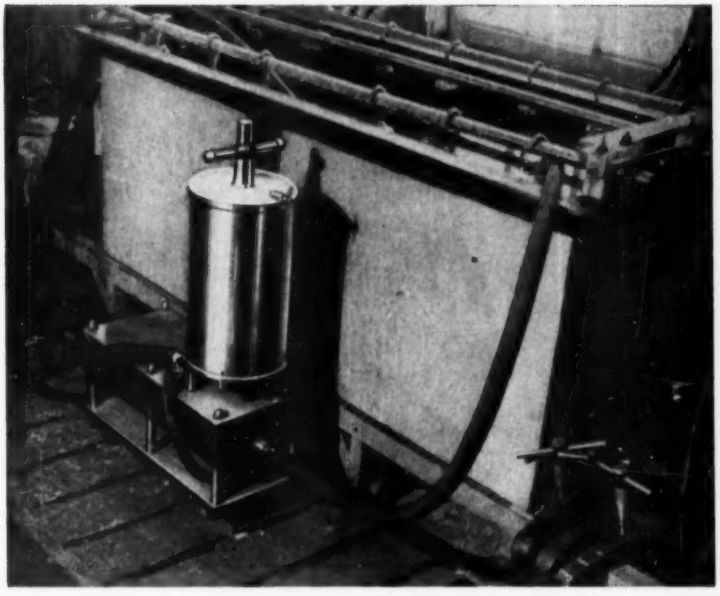
get better finished plated work — save time and labor



The "Sealed-Disc" Filter will remove all dirt, dust, and sludge from your plating solutions. You'll no longer worry about pitting, spotting, poor adhesion, formation of nodules, etc.

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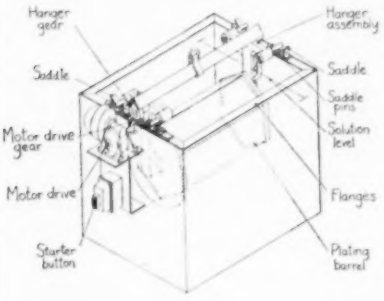
Equipment and Supplies

E—135. Improved, Compact, Streamlined Construction Mercil Plating Tank—Hanson-Van Winkle-Munning Co. announces an improved Mercil-type tank for barrel electroplating. The new tank is designed to save space, reduce maintenance cost and simplify barrel-positioning. With the exception of chromium plating, any type of plating may be carried out in the new tank.



Key improvements: (1) Flanges have been turned in to save space. (2) Motor drive has been made more compact and relocated. (3) Saddles have been redesigned. (4) An overflow trough has been eliminated. (5) Hangar assembly has been ruggedized. For more data on this new barrel unit, use Reader Service Card.

E—136. Glassware Washer—Many scientists who now spend much of their valuable time washing test tubes, flasks, and beakers will be freed soon of this tedious and time-wasting task according to an announcement by the Chemical Rubber Company, Cleveland, Ohio, that they will introduce a fully automatic glassware washer adapted especially for laboratory use.

The new device—called the CRC Labwasher—is designed primarily for use in laboratories to free highly paid and highly skilled scientists from a task that can be done easily by a low-cost machine.

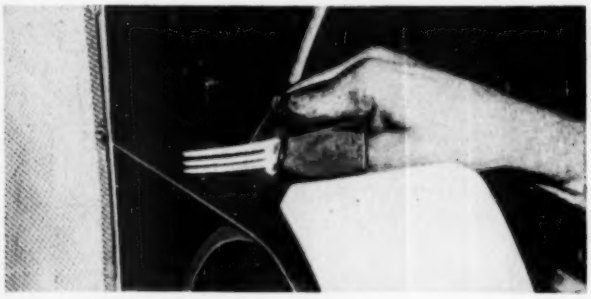
The Labwasher manufactured by Westinghouse Electric Corp., for the Chemical Rubber Co., is adapted for laboratory use, by the latter company's specially developed racks which accommodate over 90 per cent of the most-used laboratory glassware.

The CRC Labwasher has been designed primarily for the industrial laboratory. It effectively washes and dries glassware containing either oil or water soluble material. It will accommodate almost all types of flasks up to two or three liter size, as well as beakers, funnels, cylinders, graduates, and many other shapes and forms. For additional information, use Reader Service Card.

How would you SOLVE IT?

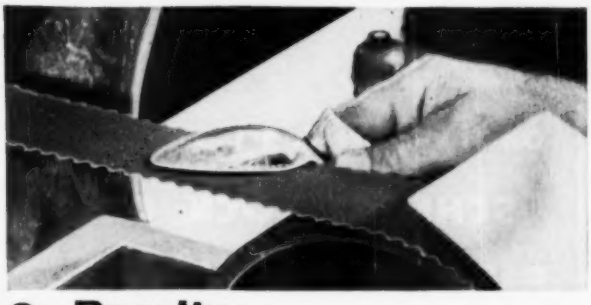
1. Production Problem:

To cut unit costs of trimming and polishing sterling silver forks and spoons. Towle Silversmiths, of Newburyport, Mass., wanted a modern, low-cost method which could equal the fine results of patient, old-time craftsmanship.



2. Solution:

A 3M Representative suggested that this manufacturer switch to 3M Belts, using Grit #150 Three-M-ite Resinite belts for shaping fork tines, the "Scallop-Edge" Belt on the bowl of the spoon, and 3M Cork Belts for polishing forks and spoons.



3. Results:

An immediate saving of 50% on the tining cost, with better quality finishes. The firm found they could finish as many as 30 lots of sterling silverware with one belt! A 3M Representative can help you solve your grinding problems, too. His services are available without cost or obligation.

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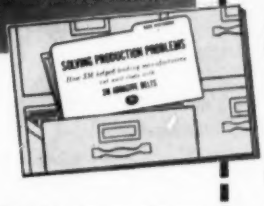

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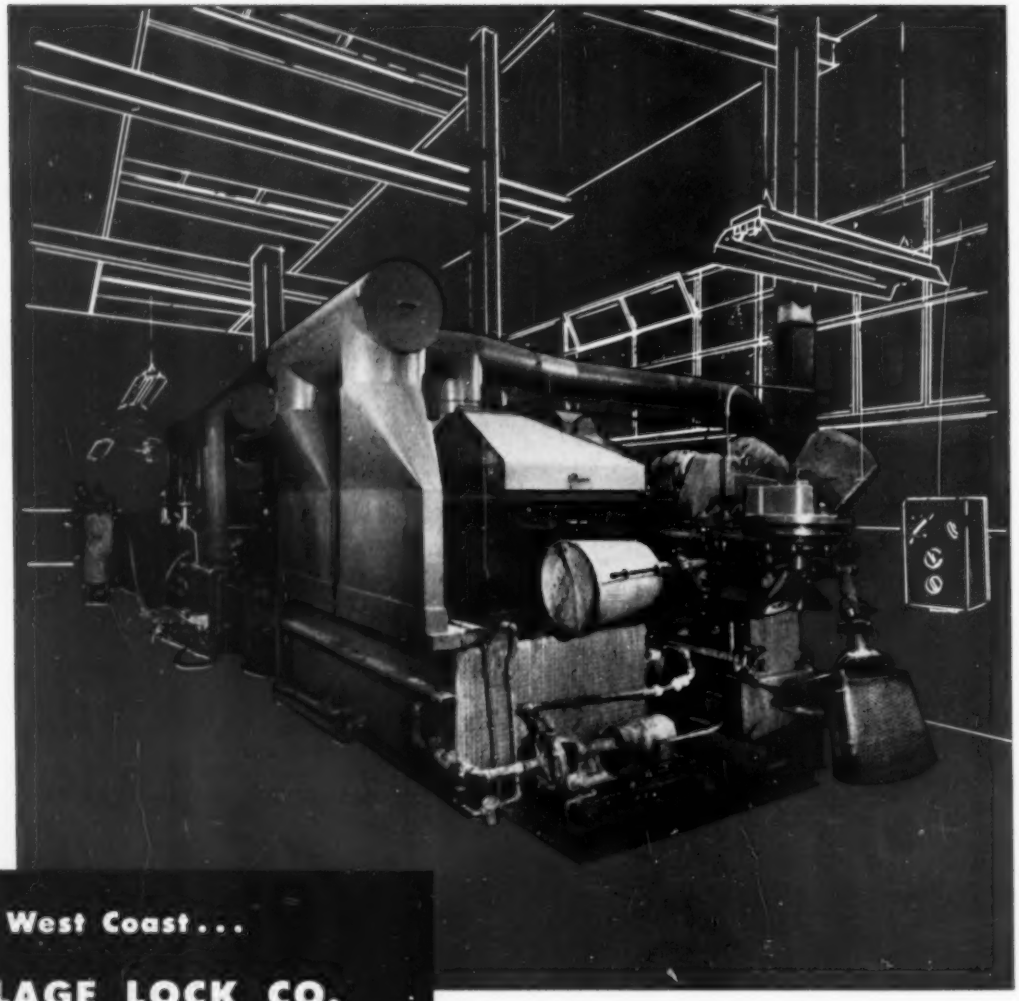

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JANUARY, 1954 VOL. 41, No. 1

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This month's cover shows a magnetic drum-type separator used for separating magnetic work from abrasive. Photo, courtesy of the Eriez Mfg. Company and the Norton Company.

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Editorial

Ion Exchangers in Plating Bath Analyses—A Forecast

PROOF THAT the use of ion exchangers in metal-finishing operations is an accepted industry technique is evident in the consistently growing application of the method in metal ion recovery from rinse waters and in the treatment of water for process lines.

The article in this issue by Mr. Gabrielson of Sweden tells of another valuable use for these materials. While the use of ion exchangers in analytical chemistry is not new, the determination of boric acid, a major constituent of many plating baths, through utilization of a sulfonic acid resin exchanger, is novel and of interest to platers. The procedure yields repetitively accurate results and appears to be a forerunner of additional practical applications for such "ion-trading" materials in other analytical methods.

By coincidence, convincing extra evidence to such a belief is provided in this issue in the book review by Dr. Harold Read. He states that "one can see many possible applications to the analytical problems of metal finishing, particularly to the determination of impurities and addition agents in plating baths".

It is a matter of record that the reporting of new methods has stimulated further work along similar lines in the past. Through identical effort in this instance, improved techniques that offer practical advantages will be found and, no doubt, will be published for the benefit of all. To this end, the first-time release of the new procedure is another reaffirmation of the dedicated aims of the Society as printed on the masthead of this journal.

Al Korbelak

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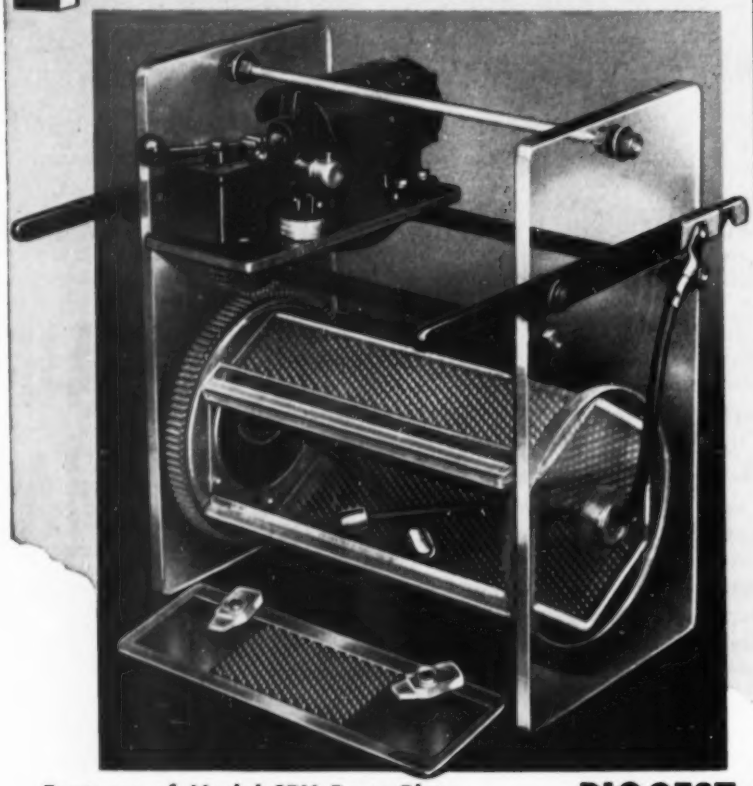

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ACCEPTANCE SAMPLING OF ELECTROPLATED ARTICLES

J. M. CAMERON* AND FIELDING OGBURN*

ABSTRACT

Acceptance sampling procedures have found widespread usage in governmental and industrial purchasing. The purpose of this note is to present some of the basic ideas behind acceptance sampling.

INTRODUCTION

When articles are being purchased, some understanding must exist between the purchaser and the supplier concerning the requirements that the items must meet, in order to be considered acceptable. Industry and government have recognized the need for definite and exact statements of such requirements and have devoted much energy to the writing of material specifications. These specifications give, in addition to the detailed requirements, a description of the test procedure by which conformance of an individual item is to be ascertained.

Ordinarily it is not feasible to accept or reject individual items from a lot. One hundred per cent inspection or screening, as it is called, is needed when the elimination of all nonconforming items is required.

When the testing is destructive or expensive, screening is out of the question and it is almost inevitable that some noncoforming items will be passed along from supplier to purchaser. The purchaser is therefore forced to make a decision as to the acceptability of an entire lot or shipment on the basis of evidence supplied by a sample of relatively few items. This procedure, known as acceptance sampling, has the aim of providing some control against the acceptance of lots with an excessive proportion of defective items. It also serves to assist the producer in the control of his product.

When acceptance or rejection is to depend upon the incomplete information supplied by a sample, there is inevitably a risk of accepting "bad" material or rejecting "good" material. It is important, therefore, that the items to be tested be selected in such a way that they reveal the maximum amount of information about the overall quality of the complete lot of material submitted for acceptance and that the acceptance criteria be chosen so as to fix the risks of wrong decision at a suitably small value.

The purpose of this note is to present some of the basic ideas involved in acceptance sampling with special reference to electroplated material.

THE INSPECTION OF ELECTROPLATED COATINGS

The inspection of electroplated coatings is, in practice, generally limited to examination of thickness, salt-spray resistance, appearance, and adhesion. In some cases, the thickness of a coating can be determined without destroying the article or coating, e. g., with a magnetic thickness gage. For coatings such as chromium over nickel, the coating is usually destroyed by the thickness test. Almost always, however, a thickness determination yields a measured value of the actual thickness besides indicating whether or not the coating passes thickness requirements.

Salt-spray tests are destructive. While there are rating systems for indicating how badly an article failed the test or how well it stood up, in general one observes only whether or not the item passed this particular test.

Appearance may include observations of such things as brightness, coverage, pits, and stains. Usually this is not done on a quantitative basis, but the piece is either satisfactory or unsatisfactory. Thus inspection of appearance is nondestructive; and does not yield a quantitative measure of quality.

Adhesion tests are all destructive and those commonly used are not quantitative.

The results from tests for these four qualities of electroplated coatings rate the coatings as either passing or failing or as being defective or nondefective. The following discussion is concerned primarily with acceptance sampling plans for this type of test, since they are the simpler and more commonly used procedures.

*National Bureau of Standards, Washington 25, D. C.

An acceptance sampling plan is a specification of the number of items to be drawn as a sample, the manner of selecting these items, and an acceptance criterion. For example, a specification calls for 0.001 inch of nickel on steel. The acceptance sampling plan specifies that the coating thickness on 10 specimens be measured and that if more than one specimen have less than 0.001 inch of nickel, the whole lot or shipment shall be rejected.

The Lot From Which the Sample Is To Be Drawn

The efficiency of any acceptance sampling scheme depends on the make-up of the lot from which the sample is to be drawn. For example, consider a shipment of 1000 items that arrives in two parts, half arriving one day, the remainder the next day. If it was known that the first day's delivery of 500 was free from defects and the second day's delivery includes 200 defective items, this knowledge could be used to advantage in designing an acceptance sampling plan. A natural subdivision of a shipment into lots (based on date of delivery, date of production, plating tank used, etc.), when known, would suggest the drawing of a sample from each such lot of the shipment. If in the example above a sample of 20 were drawn from each day's delivery, and a sampling plan were used calling for rejection if one or more unsatisfactory items were found in the sample, then the first day's delivery would be accepted and the second day's delivery (containing 40 per cent defective items) would almost certainly be rejected. In such an instance the accepted material would be entirely free of nonconforming items.

However, if the two deliveries were composited into one aggregate of 1000 items and a single sample of 20 were drawn from this aggregate (20 per cent of which are defective) the chance of accepting the entire delivery (including the 200 defective items) is calculated to be about 1 in 90 for the same rule of rejection as above. If accepted, the quality of material accepted would be the same as that submitted, 20 per cent defective. An acceptance sampling plan can be used to reduce the probability of accepting undesirable lots, but if uniformly bad material is submitted for acceptance the quality of accepted material will not be different from that submitted.

A fundamental property of efficient acceptance sampling schemes is the requirement that a sample be drawn from a homogeneous aggregate of material, called a *lot*. A homogeneous aggregate is one in which the per cent defective (or other measure of quality) is essentially the same from one part of the lot to the next. A careful definition of what shall constitute a lot involves requirements such as "manufactured under essentially the same conditions", "made from the same batch of raw material."

The method of packaging or shipping may make it impossible or impractical to isolate homogeneous lots for the purpose of sampling. In such a case some attention must be given to the method of selection of individual items so that the sample represents the entire shipment fairly.

Selection of Samples From A Lot

The manner in which samples are selected from a lot is important. The classic example of this is the box of strawberries at the grocery store. The purchaser normally inspects the strawberries which he can see, those on top. This sampling procedure has, at times, been known to be misleading. While the example of the box of strawberries may involve deliberate rearrangement, such situations can occur accidentally or in the normal course of events. For this reason one should not inspect, for example, just the first ten specimens off the plating line or take the five most accessible cases of chromium-plated stock in the warehouse.

In selecting items from a lot to constitute the sample, equal opportunity should be given for each item to appear in the sample regardless of whether the item is defective or nondefective, i. e., the items should be a random sample of the lot. Ideally, some scheme of numbering of the items and the use of a table of random numbers for selecting the individual items is the best approach for insuring the randomness of the selection. If the material comes in packages or groups, a random sample can be obtained by applying selection by random numbers at two stages—first selecting the packages, then the items from the package. If the method of generating the lot is known, some form of systematic sampling (involving, perhaps, a random starting point) is very likely to prove more efficient or economical.

The Operating Characteristics of Acceptance Sampling Plans

Despite the care that may be taken to assure a proper sample, the test results from the sample represent only partial information on the nature of the lot from which the sample was drawn. There is always the possibility that, by chance, the sample gives an unduly optimistic picture of the lot and a "bad" lot may be wrongly accepted, or conversely a "good" lot wrongfully rejected. It is possible to calculate these risks and to select a plan which will reduce them to suitably small values.

The quality of a lot is measured in terms of the percentage (or fraction) of items in the lot which are defective. If it is impossible to screen out the defective items that remain in an accepted lot, the purchaser will unavoidably find some defective items showing up along with the good items. What fraction of defective items can be tolerated varies with the product and the use to which it is put—e. g., a larger fraction defective can be tolerated in nails for a building project than in rivets for an aircraft. In most cases the purchaser can decide, on economic or engineering grounds, the fraction defective which, if present, would be upsetting to his operations. (If it is possible to screen out defective items, then in determining what fraction de-

fective he can afford to receive and accept, this purchaser must take into account the cost of screening and its efficiency in reducing the fraction which is defective to such a level as will not be upsetting to his other operations.) It is important that the chance of accepting a lot having an excessive number of defective items be kept small. At the same time the purchaser does not wish to reject too many lots of material which have an acceptably low fraction defective.

The chance of accepting a lot obviously depends on the fraction of defective items turned out by the producer. The larger this fraction, the greater is the chance that defective items will turn up in the sample and hence the less the chance of acceptance under a specific sampling plan. A graph showing the probability of acceptance of a lot as a function of the fraction defective in the lot is called an operating characteristic curve[1]. The dashed curve of Fig. 1 shows the operating characteristic curve for a sampling plan calling for a sample of 10 items and acceptance of the lot from which the sample was drawn if one or zero defective items are found in the sample.

For a given sample size the effect of increasing the allowable number of defectives is to increase the chance of acceptance of lots of a given fraction defective. Fig. 1 shows the operating characteristic curves for three sampling plans, where the sample size is fixed at 10 units and the allowable number of defectives (acceptance number) is zero, one, and two, respectively.

If the allowable number of defectives is held constant, the effect of varying the sample size is as shown in Fig. 2. As the sample size is increased, the probability of acceptance of lots of given fraction defective is decreased. These are the operating characteristic curves for the sampling plans given in the Federal Specification for cadmium and zinc plating QQ-F-416 and QQ-Z-325.

It should be noted that the operating characteristic curve gives the long run chance of acceptance of lots from material with a given fraction defective. Material with an excessively high fraction defective will almost always be rejected, but there is a calculable chance of acceptance though it may be quite small.

It is important to remember that if a producer supplies material which always has about the same percentage of defective items, the quality of the material accepted (and also the quality of the material rejected) will be the same as the quality of the material submitted. In such a case, an acceptance sampling procedure serves no other useful purpose than to assist the producer, by knowledge of the situation, in effecting better control of the quality of his material.

Design of Acceptance Sampling Plan

In order that a sampling plan be mutually acceptable to the supplier and purchaser, the risks of rejecting "good" material and of accepting "bad" material must be made suitably small. For example, a purchaser may feel that material showing 25 per cent or more

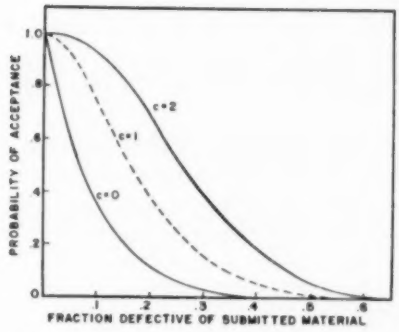

Fig. 1. Operating characteristic curves for acceptance sampling plans calling for a sample of 10 items with acceptance number c = 0, 1, 2

defective items will seriously affect his operations; at the same time the supplier may not be able to produce economically material with less than 2 per cent of defective items. If both agree that the chance of wrongly rejecting "good" material or wrongly accepting "bad" material be not greater than 1 in 20, then a sampling plan calling for a sample of 17 items, allowing 1 defective item in the sample, is required. Methods of computing sampling plans given such requirements are described by Cameron[2].

It is important to note that although the mathematical solution of the question of sample size is exact, the designation of limits for "good" and "bad" material, and the selection of the risk levels are generally far from exact.

In situations where practical considerations dictate the size of sample, one has only the choice of the acceptance criterion at his disposal. A choice of the plan to be used can be made by comparing the operating characteristics of the various possible plans.

Small lots present difficulties since usually only a very few items can be tested. This means that it is

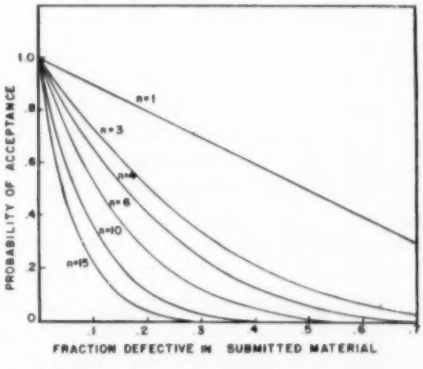

Fig. 2. Operating characteristic curves for acceptance sampling plans with acceptance number zero and sample size n

not possible to design a sampling plan that will have much power of discrimination between good and bad lots (for example, see Deming[3], p. 286).

Practical Considerations in the Selection of A Sampling Plan

Perhaps the most important practical consideration in the selection of a sampling plan is cost. The cost of drawing items from the lot, of testing the items, and in some cases the cost of the items themselves, must be balanced against the risks of wrong decision regarding the lot. This problem is largely economic in nature. For example, the failure of an inexpensive resistor in some ordnance device may result in the loss of thousands of dollars. It may be economic, therefore, to spend considerably more on acceptance testing than the cost of the entire lot of resistors. Cost considerations may dictate an upper limit to the number of items that is to be drawn as a sample for test. The problem of the appropriate sampling criterion can be decided upon after a study of the operating characteristic curves for various acceptance criteria for that given sample size.

An important consideration in selecting a sampling plan is the level of quality (fraction defective) that is turned out by the producers whose products have a relatively low incidence of nonconforming items. Little material would ever be procured if the sampling plan was so stringent as to reject 99 times out of 100 the material of the producer with the lowest incidence of nonconforming items. It is desirable that the sampling plan have a high probability of acceptance associated with the fraction defective representative of the best industrial practices.

The above considerations relate to the selection of sampling plans from considerations based on their operating characteristics. Such studies cannot be avoided, but there are other factors that enter into the picture. For example:

(1) A larger number of items can be required for simple and inexpensive tests. Thus for electroplated materials the appearance and nondestructive thickness tests may be made on a larger number of items than can adhesion or salt-spray tests. Since the four tests are not completely independent (poor workmanship or poor plating practices will often show up in more than one type of test), one is exercising control, at least partially, against deficiencies on all characteristics by a more stringent acceptance sampling plan for the nondestructive tests.

(2) A knowledge of the production record of the supplier can be used to an advantage in reducing the number of tests required. For example, if a long history of satisfactory products has been recorded for a particular manufacturer, relatively small sample sizes are quite safe. Procedures exist for dropping from "normal" to "reduced" inspection when a sequence of adequately good lots has been the experience. Also it may be that the quality produced is known to fall into two classes, either good or extremely bad. For such a case, adequate protection can be obtained from rather small sample sizes.

(3) If costs or other considerations do not permit one to test a sufficient number of items to insure the desired quality, one can raise the specification requirements. This, however, may increase the cost of the product.

General Sampling Plans for Electroplated Coatings

In some general plating specifications, sampling tables have been given. The sampling plans in these tables for most instances represent a minimum inspection plan, and seldom an optimum inspection plan.

It would be very desirable to have a universal sampling table which could be recommended for electroplated coatings. Unfortunately, no such sampling table would be satisfactory in all situations. This is evident when one considers that the optimum plan is dependent on such things as the costs of testing, the costs of obtaining samples for test, the costs of the articles destroyed by testing, how critical the requirements are, the lot size, the costs of a bad decision as to the acceptability of a lot, the time required for testing, and urgency for delivery of the plated articles. Each factor differs from situation to situation, and hence an optimum plan for each particular situation must be developed in the light of considerations such as those mentioned in this paper.

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THE DETERMINATION OF BORIC ACID IN NICKEL PLATING AND ACID ZINC PLATING BATHS BY MEANS OF CATION EXCHANGERS

GUNNAR GABRIELSON*

Introduction

In a recent paper[1] it has been shown that nickel interferes with the determination of boric acid in nickel plating baths. According to the authors of that paper there are three ways of removing nickel that will prevent its interference in the analysis: (a) deposition by electrolysis; (b) precipitation and (c) formation of complex nickel compounds. Their recommended method involves precipitation of nickel with potassium ferrocyanide followed by titration with standard alkali without filtration of the solution.

There is, however, another way of removing the nickel ions, namely by percolating the solution through a layer of a hydrogen saturated cation exchanger, whereby all cations present are exchanged for hydrogen ions. It is the aim of this paper to investigate the determination of boric acid in nickel plating and acid zinc plating solutions, when interfering ions have been removed in this way.

Theory

An organic cation exchanger consists in principle of an insoluble substance containing acid groups, e. g., sulfonic acid groups or carboxyl groups. Exchangers of the sulfonic acid type may be used both in acid and in alkaline solutions, whereas exchangers of the carboxylic acid type may be used only in alkaline or neutral media. For the analysis of nickel plating and acid zinc plating baths, therefore, a cation exchanger of sulfonic acid type should be used.

When a nickel or zinc salt solution is percolated through a bed of a strongly acid cation exchanger (i. e., containing sulfonic acid groups) in the hydrogen form, the following reactions take place (RSO_3H = the hydrogen saturated cation exchanger):

$$NiCl_2 + 2RSO_3H = 2HCl + (RSO_3)_2Ni$$
$$NiSO_4 + 2RSO_3H = H_2SO_4 + (RSO_3)_2Ni$$
$$ZnSO_4 + 2RSO_3H = H_2SO_4 + (RSO_3)_2Zn$$

The cations, therefore, are exchanged against hydrogen ions and after passage through the resin layer the effluent contains only acids, the interfering ions being retained by the cation exchanger.

Apparatus

The cation exchanger used was a sulfonic acid type† with a particle size of 0.20 – 0.49 mm in air dry condition. The ion exchange columns were of ordinary type[2] with the diameter and height of the resin layer 10 mm and 150 mm, respectively.

The ion exchanger was transformed into the hydrogen form by passing 100 ml of 3–4 N hydrochloric acid through the column followed by subsequent washing with distilled water (about 150 ml) until neutral reaction of the filtrate was obtained. The flow-rate was about 3 ml per minute during the regeneration and washing.

Choice of Indicator

In the literature various indicators and combinations of indicators have been proposed for the titration of boric acid. In preliminary experiments the following were used by the author: (1) phenolphthalein; (2) methyl red-phenolphthalein and (3) bromothymol blue. The experiments were performed in the following manner: 10 ml of a model solution, containing only boric acid, were slightly acidified by means of hydrochloric acid and a few drops of respective indicators were added (phenolphthalein, methyl red and bromothymol blue). The solutions were neutralized with 1/10 N sodium hydroxide solution after which 7–8 grams mannitol were added. The solutions with phenolphthalein and bromothymol blue were then directly titrated with 1/10 N sodium hydroxide, whereas phenolphthalein was added to the solution with methyl red before the titration was continued. The results are presented in Table I. As seen from the table, the titration against phenolphthalein (solution No. 1) gives

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†Amberlite IR-120, Rohm & Haas Co., Philadelphia, Pa.

TABLE I. RESULTS OF TESTS WITH VARIOUS INDICATORS

Solution number	Grams H_3BO_3 in the sample	Grams H_3BO_3 found	Absolute error in grams	Per cent relative error
1*	0.1999	0.1682	0.0317	−15.9
		0.1688	0.0311	−15.6
2†	0.1999	0.2016	0.0017	+ 0.85
		0.2022	0.0023	+ 1.15
3‡	0.1999	0.2004	0.0005	+ 0.25
		0.2007	0.0008	+ 0.40

*Phenolphthalein indicator
†Methyl red-phenolphthalein indicators
‡Bromothymol blue indicator

TABLE II. RESULTS OF DETERMINATIONS OF BORIC ACID CONTENT OF THREE DIFFERENT NICKEL BATHS

Solution number	Grams H_3BO_3 in the sample	Grams H_3BO_3 found	Absolute error in grams	Per cent relative error
1*	0.1000	0.1000	0.0000	±0.0
		0.0996	0.0004	- 0.4
2†	0.0601	0.0599	0.0002	−0.3
		0.0603	0.0002	+ 0.3
3‡	0.0901	0.0903	0.0002	+ 0.2
		0.0900	0.0001	−0.1

*Watts' nickel bath
†Double nickel salt bath
‡High chloride nickel bath

too low a value. Of course, this is because the color changes at so high a *p*H that some of the boric acid is neutralized before mannitol is added.

Titration against methyl red-phenolphthalein (solution No. 2) gives a somewhat high value, which is in accordance with the paper cited above[1]. The most suitable indicator was found to be bromothymol blue (solution No. 3), which gave excellent results and therefore was chosen for the experiments described in this paper.

Determination of Boric Acid in Nickel Plating Baths

Three different types of nickel plating baths were used, the formulas of which were taken from the literature[3]. The compositions of the solutions were:

(1) *Watts' type of nickel bath:*

$NiSO_4.7H_2O$	300 g/l
$NiCl_2.6H_2O$	38 g/l
H_3BO_3	20 g/l

(2) *Double nickel salt bath*

$NiSO_4.7H_2O$	75 g/l
$(NH_4)_2SO_4$	38 g/l
NaCl	13 g/l
H_3BO_3	6 g/l

(3) *High chloride nickel bath*

$NiCl_2.6H_2O$	188 g/l
H_3BO_3	18 g/l

The boric acid used for the preparation of these solutions was of a very high grade of purity.

5 ml of the solutions 1 and 3 above, and 10 ml of the solution 2 (a larger volume of 2 could be treated because of the lower salt concentration in this type of bath) were passed through the cation exchange layer at a flow-rate of 4–5 ml per minute. Afterwards the resin bed was washed with 50 ml distilled water. The effluent and the wash water were collected in a beaker and titrated against bromothymol blue first with 1 N sodium hydroxide (this strong solution was used in order not to increase the volume too much when neutralizing the strong acids formed at the ion exchange passage.) When the neutralization was almost complete the titration was continued with 1/10 N sodium hydroxide to the distinctly bluish color of the solution. Then, about 7–8 grams of mannitol were added, when the color changed back to yellow, and the titration was continued again with 1/10 N sodium hydroxide to distinctly bluish color. (Because the effluent from the ion exchange column is completely colorless the color changes at the titration are very distinct.)

If one were to assume that the consumption of 1/10 N sodium hydroxide after the addition of mannitol was 1.0 ml, then the content of boric acid in the sample is:

$$\frac{a \times 0.1 \times 61.84}{1{,}000} \text{ grams}$$

The results of the boric acid determination are presented in Table II in which the number of the solution refers to the nickel plating baths above. As is seen from the table, the method gives very accurate values of the content of boric acid in all the three types of nickel baths used, the mean relative error being <0.5 per cent which means a very good agreement.

The method outlined here can, of course, be also used in the determination of boric acid in cobalt plating solutions.

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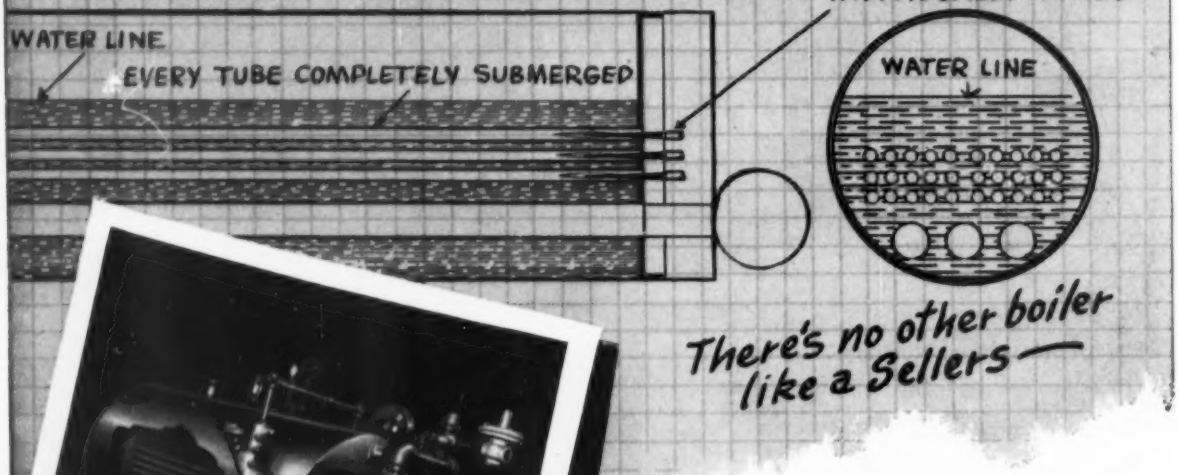

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Determination of Boric Acid in Acid Zinc Plating Baths

In the determination of boric acid in acid zinc plating solutions zinc is removed by precipitation as basic carbonate, which is then filtered off before the boric acid is titrated[4]. The interfering cations also can be removed with an ion exchanger.

Two different zinc solutions were used in the following experiments, the formulas of which were taken from the literature[5]. The compositions of the solutions were:

(1)	$ZnSO_4.6H_2O$	150 g/l
	$(NH_4)_2SO_4$	50 g/l
	H_3BO_3	10 g/l
(2)	$ZnSO_4.6H_2O$	300 g/l
	NaCl	10 g/l
	$Al_2(SO_4)_3$	20 g/l
	Dextrin	6 g/l
	H_3BO_3	18 g/l

10 ml solution of 1 and 5 ml of solution 2 were percolated through the cation exchanger and the combined effluent and wash water were titrated exactly as described before. The results, which are presented in Table III (solutions 1 and 2 respectively refer to the bath compositions given above) show that the method is as accurate for zinc as for nickel solutions, the relative error being <0.5 per cent.

Discussion

The method of removing interfering ions by means of an ion exchanger is already quite common in analytical chemistry. In the method described in this paper not only nickel and zinc but all other cations present in the solution are exchanged for hydrogen ions by passing the solution through a bed of a hydrogen saturated cation exchanger of sulfonic acid type. After the passage of the resin layer the solution contains a mixture of strong mineral acids (e. g., sulfuric and hydrochloric acids) and boric acid. In this colorless filtrate the color changes at the titration are very distinct. Because of this, the most suitable indicator for the *p*H interval in question can be chosen. On the other hand, when titrating the green nickel plating baths one must take into consideration the fact that the color changes at the titration should be detectable in the colored solution. In the present investigation it was shown in the preliminary experiments that bromothymol blue was very suitable in the titration of boric acid and this indicator was therefore selected. This possibility of selecting the most suitable indicator for the *p*H interval in question regardless of the color changes leads, of course, to higher accuracy at the analysis.

The procedure outlined in this paper may be more time-consuming than the method in which nickel is precipitated with potassium ferrocyanide as recommended in the paper cited above[1]. Also, the use of the cation exchanger for the removal of nickel prevents the operator from determining the mineral acid content of the nickel plating bath, prior to the boric acid determination. In some instances this may be a disadvantage of the cation exchange method. However, as the ion exchanger does not require any supervision when the solution passes the column, the somewhat longer time required need not be wasted. It may also be a fact that, in special cases, the property of the cation exchanger in the hydrogen form to exchange all positive ions for hydrogen ions can be of value when ions other than nickel and zinc interfere with the determination of boric acid.

TABLE III. RESULTS OF DETERMINATIONS OF BORIC ACID CONTENT OF TWO TYPES OF ZINC BATHS

Solution number	Grams H_3BO_3 in the sample	Grams H_3BO_3 found	Absolute error in grams	Per cent relative error
1	0.1001	0.0998	0.0003	−0.3
		0.1002	0.0001	+0.1
2	0.0900	0.0903	0.0003	+0.3
		0.0902	0.0002	+0.2

It may be mentioned that it is possible to use the sodium form of the ion exchanger. After the ion exchange passage the combined effluent and wash water are slightly acidified and titrated as before. In this case the consumption of sodium hydroxide is lower than before, because only sodium salts are formed at the ion exchange passage, but the capacity of the ion exchanger is lower because the hydrogen of the boric acid is also exchanged against sodium.

In ordinary cases it seems to be more simple for practical work of sufficient accuracy to precipitate nickel with potassium ferrocyanide or to use a blank in order to correct for the interference of nickel. When a very accurate determination of boric acid in nickel plating baths is required or when the nickel solution contains interfering ions other than nickel the ion exchange method is to be preferred. For the boric acid determination in acid zinc plating baths the method outlined here seems to be much simpler than the methods hitherto used.

Summary

(1) A method for the determination of boric acid in nickel and acid zinc plating baths has been devised, using a cation exchanger of strongly acid type in the hydrogen form to remove nickel, zinc and other interfering ions.

(2) Recommended procedure: 5 or 10 ml of the nickel or zinc solutions (depending upon the salt concentrations) are percolated through a layer of a strongly acid cation exchanger in the hydrogen form (diameter and

height of the layer are 10 and 150 mm, respectively) at a flow-rate of 4–5 ml per minute. After the resin bed is washed with 50 ml distilled water the combined effluent and wash water are titrated against bromothymol blue; first with 1 N sodium hydroxide solution to neutralize the strong acids formed at the ion exchange passage and then, when the neutralization is almost complete, the titration is continued with 1/10 N sodium hydroxide solution to distinctly bluish color. Then, 7–8 grams of mannitol are added and the titration is continued again to the color endpoint. From the results of these titrations the amount of boric acid can be determined as described previously in this paper.

(3) The method outlined here is very accurate, the maximum relative error being <0.5 per cent.

Acknowledgment

The author wishes to express his indebtedness to Mr. G. Jonson for permission to publish this paper.

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Third Annual Interim Meeting

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FEBRUARY 13, 1954
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For delegates primarily but all AES members are invited. A feature of the Interim Meeting will be nominations for National Third Vice-President.

TIME OF MEETING:—SATURDAY—10 a.m.

Tentative Program and Agenda

Time	*Event*
10:00–10:15	Opening Remarks
10:15–10:30	Finances
10:30–11:00	Membership and AES Facts
11:00–noon	Branch Officers' Manual
noon–12:30	Open
12:30– 1:55	Luncheon
2:00– 2:15	Executive Secretary's Report
2:15– 3:00	Editorial Board
3:00– 3:30	Broadening of the Society Base
3:30– 4:00	Research and Sustaining Membership, Process Control Handbook
4:00– 4:15	Advertising Manager's Report
4:15– 4:30	Delegates Handbook
4:30– 4:45	Nominations for Third Vice-President—Open
4:45– 5:00	New York City Convention Report
5:00– 5:30	Cocktail Hour

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PRECISION BARREL FINISHING

MALCOLM M. MAYNES*

Introduction

Mass production at unprecedented rates of small parts of all kinds, such as ferrous and nonferrous castings, die castings, steel forgings, stampings, and certain screw machine products, has brought to the attention of production people the problem of economically and satisfactorily finishing these pieces. See Figs. 1, 2. Burrs, sharp edges, flash, tool marks or heat-treating scale must be removed prior to assembly or sale. When parts are to be plated, the problem of a good surface finish is of particular importance. See Fig. 3.

Because of the high unit cost of hand finishing such pieces, any operation such as filing or scraping, bench or portable grinding, should be examined carefully. Abrasive tumbling, or as it is more aptly termed, barrel finishing, is an up-to-date and increasingly popular method of deburring and surface finishing metal parts. This is a modern, fast and low cost metal finishing process which removes burrs, scale, tool marks, and flash. The method also is utilized to produce desired surface finishes and forming radii to blueprint specifications. It has the added advantage of being able to produce close duplication of results on lot after lot of the same parts.

Typical of the many plants that have tried and enthusiastically adopted the abrasive barrel-finishing method is that of a large manufacturer who is processing as many as 8,500 different parts in this manner, with an average weekly output of tumbled parts reaching 4,000,000. Over 3,000 man hours per week are saved over the former deburring methods.

Parts to be tumbled do not have to be small. They can be of substantial size. There are known installations where parts weighing over one hundred pounds are being barrel finished. There is practically no limit to the scope of this method of finishing.

Tumbling processes for finishing metal parts have been used for many years in the metal working industries. Older methods of deburring and tumbling depended upon a peening or a very slow grinding action. The tumbling media used were mainly stars and slugs, sand, quarried products, or even parts against parts. These were all dry operations called generally "rattling."

Modern Barrel Finishing

Results obtainable from these older methods were either costly, slow, or generally unsatisfactory when compared with modern barrel-finishing methods for

Figs. 1 and 2. Typical parts which can be barrel finished

*Abrasive Sales Engineer, Norton Company, Worcester, Mass.

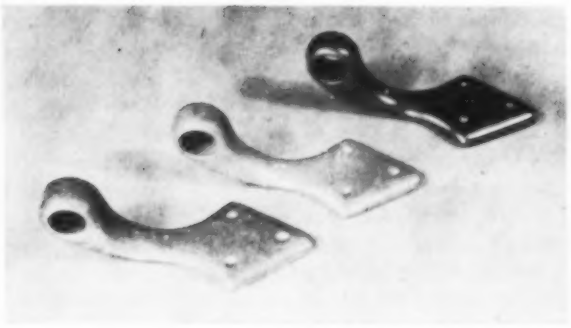

Fig. 3. Hinge before and after tumbling

they tended to peen over the burrs instead of removing them. They failed to remove surface imperfections, tool marks and scratches. In many cases the parts being tumbled actually nicked one another during the process further impairing the surface finish.

Developed during World War II, a new medium for barrel finishing has opened many new fields in metal finishing. It added precision to the finishing process.

Aluminum oxide abrasive used with appropriate chemical agents in suitable tumbling barrels proved to be the solution for many finishing problems.

Abrasive tumbling was not an immediate cure-all however. There were several years of experimentation during which some companies had unhappy experiences. However, success of many others helped to develop a knowledge of the subject to the point where today barrel finishing is an accepted manufacturing process.

The causes of early failures have been eliminated by training of personnel or by installation of more suitable equipment. At first, many companies found that inexperienced and untrained personnel were the cause of unsatisfactory results which were quite costly. As a result, these companies obtained an unfavorable impression of the results of barrel finishing.

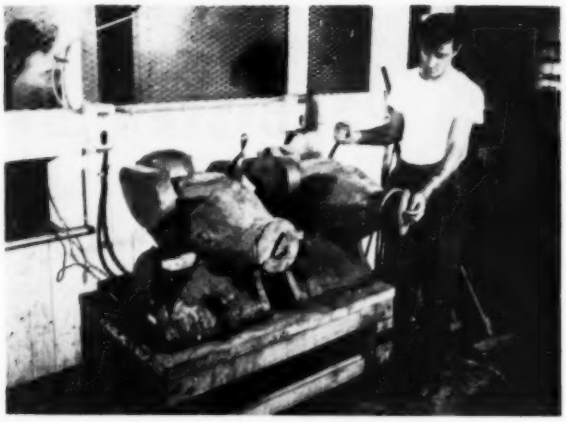

Fig. 5. Tilting bottle type barrel

Likewise the wrong types of equipment contributed to early failures. Barrel finishing, like any other metalworking operation, requires well-designed and well-made equipment to obtain best results. Poorly designed and cheaply constructed machines will surely result in time out for repairs and production man hours lost. It is wise to buy this equipment from established manufacturers and to select the best.

Types of Barrels

There are several types of barrels on the market today. Each is suited to a particular purpose. The user should select his equipment according to his own needs. There is no universal tumbling barrel.

First there is the tilting type barrel. One of the oldest types, this barrel is particularly useful for work such as drying with sawdust or ground corn cobs and for fine abrasive tumbling. It can be used for ball burnishing and in some cases for self tumbling.

It quite often happens, however, that this drum

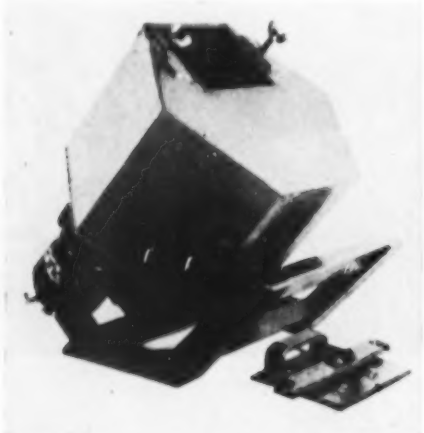

Fig. 4. Portable bench type tumbler

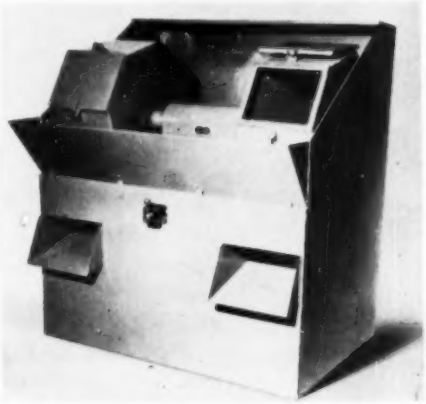

Fig. 6. Job lot barrel

does not work satisfactorily in removing burrs or for finishing with the heavier abrasive due to the weight and density differential between the work and the abrasive. The abrasive gravitates to the back of the barrel while the lighter parts come to the surface of the mass. Obviously the cutting action of the abrasive chips cannot take place.

Fig. 4 shows an oblique type barrel which has been designed for ease of portability. Such a barrel is commonly referred to as a portable bench type tumbler.

Another barrel is the bottle type. This is a tilting type barrel with approximately the same action as the tilting barrel itself. See Fig. 5. Its shape is somewhat different, causing more action within the barrel.

Next is the job lot barrel for small parts. See Fig. 6. This is usually a small horizontal, octagonally shaped barrel with interchangeable drums varying from 8 by 16 inches to 12 by 24 inches. These are primarily for small parts or small quantities of larger parts. They are quite useful for experimentation in setting up standard procedures for large runs of similar parts.

The large octagonal barrels are made for high production runs. See Fig. 7. These are available in many sizes with either single or multiple compartments. Ordinarily they are equipped with variable speed drives and brakes.

The last classification is the so-called triple action barrel. This type can be obtained in various sizes with variable speeds. It is noted for its fast cut due to the action within the barrel caused by its shape. The parts travel toward the center from each side and then slide with the revolution of the cylinder.

Auxiliary Equipment

Auxiliary equipment analysis is now made. A timing device can be used to very good advantage to shut off the barrel at the completion of the time cycle or to start it so it will be ready to unload at the beginning of the next working day. Since the normal tumbling cycle requires a period of several hours, it is possible to operate the barrel automatically after normal working hours thereby permitting more than one shift production with only a one shift operator.

An unloading boot will aid in lowering parts without nicking onto the separator screen. This simple device can be made with plywood and a canvas bag.

A loading pan with removable bar will greatly facilitate loading and unloading and sometimes separating the parts from the tumbling medium.

A reversing switch to change direction of barrel rotation at mid-cycle is a useful piece of equipment, particularly if the work shows a tendency to separate from the abrasive chips during the cycle.

A hoist to raise and lower media pans, while not absolutely essential, will speed up the loading of the barrel.

Another important piece of tumbling room equipment is a separating device for separating work from

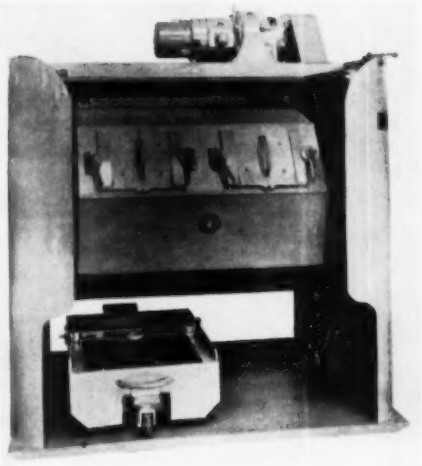

Fig. 7. Octagonal high production barrel

abrasive. See Fig. 8. Either brass or rubberized screens should be employed to make them nonmagnetic in case a hand magnet is used to pick up the parts. Another separating device is the rotary drum type magnetic separator usually used in conjunction with an endless belt. See Fig. 9. This device is suitable for large installations.

Another valuable adjunct to the tumbling room is a set of bins with sufficient compartments to store the various sizes of tumbling media. These can be constructed either of metal or wood. Provision should be made to allow seepage of water to drain to an outlet.

A settling tank or trap should be placed behind the barrel or line of barrels to catch all waste material. This will prevent stoppage of the sewer system. The floor should be pitched toward the settling tank in order to assist in drainage. A clean floor will minimize the chance of injury to the operator caused by slipping.

Suitable rust proofing equipment should be pro-

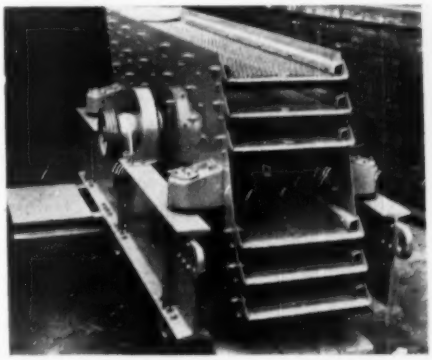

Fig. 8. Vibrating screens used for separating chips after tumbling runs

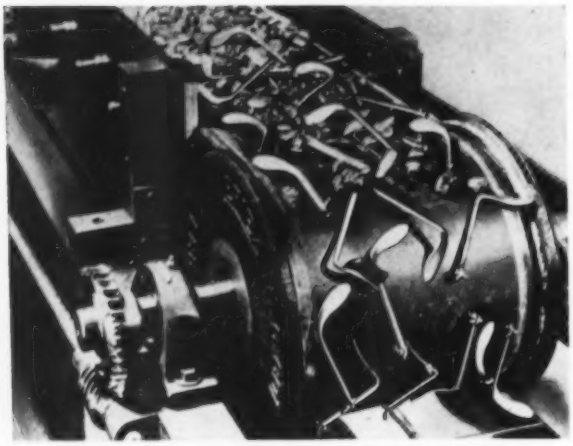

Fig. 9. Magnetic drum type separator for separating magnetic work from abrasive

vided. This may consist of a slushing tank filled with a water displacing agent or a suitable drying barrel.

Other aids tending to increase the efficiency of the barrel finishing installation are:

1. Running hot water for rinsing purposes
2. Compressed air
3. Graduated measuring beaker for use with cleaners
4. Weight scales
5. *p*H papers for determining acidity and alkalinity
6. A card index file for maintaining a record of procedures

Barrel Finishing Media

In barrel finishing, no single medium will answer all purposes. For burnishing purposes, there are steel balls, pins, and cones. The action of these materials tends to close the pores of the metal, thereby producing a high lustre and bright color. This operation is one that is used extensively where the parts are to be plated.

Several types of natural media are available such as limestone, granite, pea gravel, etc. These materials have their limitations because of their relatively low unit weight, about 80 pounds per cubic foot. They are suited for the removal of light burrs, and for improving finishes. Usually a cutting compound is needed in order to speed the rate of cut.

Ground corn cobs and hard-wood sawdust are employed for either drying or light burnishing operations. They have little or no deburring value.

Bonded chips are also available, weighing approximately 100 pounds per cubic foot. These are capable of producing high finishes and good color. For deburring with this kind of medium, it is necessary to add a cutting compound to aid the deburring action of this comparatively light chip.

The favorite medium is the heavy aluminum oxide weighing approximately 125 pounds per cubic foot. In recent years, due to new developments and refinements, this material has become recognized as the fastest of all deburring materials. It has more uses and is more efficient than any of the others and because it is pure aluminum oxide, it is not necessary to add an extra cutting compound.

As a result of extensive laboratory and field work, it is now possible to obtain low micro-inch surface finishes, as well as high lustre.

Cleaners

There are a multitude of commercial cleaners on the market, many of which are adaptable to barrel finishing. Some of these are good, some are economical and others quite expensive.

Actually, the cleaners and detergents fall into three basic types: acid, alkaline, and neutral.

The acid type is used primarily for descaling parts which have been heat-treated and to remove oxidation. The solution is rarely used for more than two hours at a time, since the scale is removed well within this cycle. Parts should never be allowed to remain stagnant in an acid solution but should be treated at once with an alkaline material to neutralize any acid carryover. This cannot be emphasized too strongly since there is a definite tendency of the acid to etch the work.

Alkaline cleaners are used in the roughing operation on ferrous metals to prevent rusting and to maintain the natural color of the metal. As previously mentioned, they also may be used as an acid neutralizer, as a wash to remove oil or to brighten parts prior to the finishing operation. It is well to bear in mind that these alkaline cleaners should not be used on nonferrous metals because an alkali burn will result. This is in the form of a black coating or film similar to a grease.

Neutral cleaners or detergents are used for final finish on all metals. These are usually high titer soaps that create a thick, heavy solution of suds which serves to cushion the work from the abrasive and from the other pieces.

Determination of Procedure

Equipment, media, and cleaners—the three components necessary for barrel finishing have now been discussed. They are all useless, however, until a proper operating procedure has been determined. An examination of the factors which determine procedure is now in order.

First to be considered are the size and shape of the parts.

In considering these features one must take into account recesses, angles, fillets, slots, holes, and intricate contours in the parts. The tumbling medium must be of such size that it will reach all surfaces that must be finished and also that it will not wedge in the work. The coarsest size that will reach all surfaces to be finished should be used because the coarser

sizes cut faster. Often a mixture of sizes is necessary if small radii are involved.

Second factor to be considered is that of the kind of metal and its hardness.

Obviously, hard metals are less subject to a peening action than soft ones. Also, everything else being equal, a longer run will be required for the harder metals. The nonferrous metals generally require a shorter time. It is well to remember that different cleaners generally are required for ferrous and nonferrous metals.

A third factor, and an important one, is the size of the burr on the parts.

Normal and accessible burrs can be removed whether in the soft or hard state, but best results are obtained generally in the hard state. If the burrs or fins are too large, the bulk of the metal should be removed with a grinding wheel before tumbling.

The fourth factor to be considered is the one of the finish required on the parts.

When one seeks to determine the required finish for any given production item, it must be remembered that the proportions of parts, cleaner and tumbling medium together with the length of run are as important as the size of the medium. Actually, they are determined by trial as will be described later.

Operating Procedure, Roughing Runs

As for the actual operating procedures, generally, a roughing run is as follows:

1. Barrels are filled with the tumbling medium up to the top of the shaft.

2. Work pieces are added until barrels are 5/8 to ¾ full. If the parts are such as to be nicked easily, it may be better to load the parts and tumbling medium in layers.

3. Water is added until level with the top of the load.

4. Next is the addition of the cleaner selected for the roughing operation (in the average ratio of one ounce to a gallon of water).

5. Operating speed of the barrels are selected then. If the barrels are equipped with a variable speed, it should be run at approximately 125 to 150 surface feet per minute for most roughing operations. Extra heavy or critical burrs should be removed at slower speeds. After about one hour it can be expected that such burrs will have been ground off sufficiently to permit increasing the speed for the rest of the roughing operation, thus saving overall running time. However, parts which have a tendency to distort must be tumbled at lower speeds.

6. Barrels are run for one hour.

7. The work is inspected. If the desired results have not been achieved, the runs are continued and the work inspected again every 30 to 60 minutes. The total time required on the first run will establish the standard time for the operation. On subsequent trial runs, the proportion of parts to tumbling medium can be increased until the desired results no longer are obtained in the standard time or until there is evidence of the parts nicking each other. In this way, the standard procedure for a given part will be established and can be followed thereafter.

Operating Procedure, Finishing Runs

In the finishing run, these steps should be followed:

1. Work is rinsed thoroughly, preferably with hot water, for the purpose of removing chemicals and abrasive residue. Occasionally, an alkaline cleaner used as a wash, aids in restoring the parts to their original color. This will be for parts that have been processed for an exceptionally long time in the roughing operation. In any event, a clear water rinse is used as the last rinse.

2. Barrels are filled with water to within five inches of the top of the load.

3. Next is the addition of a neutral cleaner in the proportion of two ounces per gallon of the water now in the barrel.

4. Barrel speed is set at about 150 surface feet per minute.

5. Work is run for one hour.

6. The work is inspected. At this point it should be completely satisfactory, but it may be necessary to extend the run.

7. Barrels are unloaded.

8. The work is separated from the tumbling medium.

9. The work is dried.

Operating Hints

Before closing, a few helpful hints are mentioned. For instance, the barrel-finishing medium should be checked for size periodically because the grinding action within the barrel eventually will wear the chips down to the next smaller size. Aluminum oxide retains its cutting efficiency until it finally wears down to nothing. The medium should be rescreened when it appears to be wedging in the workpieces.

For best results, it is desirable to keep the medium graded according to size at all times.

Holes, recesses, slots, etc., that must be protected should be plugged with rubber, paper, wood, etc. Edges that must be left sharp should be masked; a plastic dip coating is sometimes used for this purpose. Care must be taken to be sure that the plugs are under the surface of the work.

The water used for barrel finishing should be tested periodically for purity and hardness, as water that is either hard or contaminated is apt to affect the finish by causing pitting, staining or rusting. The cleaner also may react somewhat differently. In some areas, a water softening agent should be added.

Rubber-lined barrels are preferred generally and are recommended because they do not require as much care as wood-lined barrels. Nevertheless, barrels

should always be rinsed thoroughly with water between runs.

A desirable feature of the continuous rubber lining in good condition is that it will not have cracks which might catch parts and distort them, or chips which, if they become dislodged, might cause trouble in subsequent runs.

Care must be taken not to damage the rubber lining around barrel openings with the loading pan or cover. If the loading pan has protruding sharp edges, they should be covered in some way with a cushioning material.

When cleaning the barrels in preparation for a new run, care should be taken to remove *all* of the tumbling medium previously used. Any particles allowed to remain, if they are of a different size than required for the next load of work, will contaminate that load. Larger particles may ruin the finish; smaller particles will cause trouble by wedging in oil holes, slots, etc. For the same reason, the unloading pans, separator screens and canvas unloading boot should be cleaned thoroughly before changing to a different size chip. The matter of cleanliness cannot be emphasized too greatly.

Conclusions

The important factors to be studied in setting up a tumbling department are:

1. The equipment that must be obtained should be suitable for the quantity and the size of the parts involved and should be purchased from recognized manufacturers. A rather complete list of items is necessary and good quality is important.

2. The tumbling medium is a major item. Most tumbling operations distinctly call for abrasive action. Aluminum oxide tumbling abrasive is best suited for most requirements because of its fast-cutting ability.

3. The selection of cleaners is important and should only be undertaken with the assistance of experts in the application of chemicals for this purpose.

4. Definite procedures must be set up for each job. Experience will enable the supervisor to approximate the correct proportions of ingredients and proper running time. The most efficient combination can be arrived at only by carefully planned trial runs.

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*AUTHORS

THE NATURE, CAUSE AND EFFECT OF THE POROSITY IN ELECTRODEPOSITS

I. THE POROSITY OF ELECTRODEPOSITS†

Introduction

Electrodeposits of the thicknesses commonly used generally contain minute porosities. It has long been considered that these imperfections constitute one of the primary reasons for the failure of cathodic type coatings to protect the basis metal for extended periods of time. Many chemical methods for detecting porosity were developed on the premise that the protective value of a coating was related in an inverse manner to its porosity.

Subsequent experience showed that the correlation between porosity tests and service tests left much to be desired. In this light, the American Electroplaters' Society established Research Project No. 6, the purpose of which was the study of the porosity of electrodeposits. In the course of this investigation a new method of studying coatings, involving the measurement of their permeability to gases, was developed by Thon and co-workers[1].

Project No. 13 was initiated to study the applicability of the gas permeability method as a means of determining the protective value of electrodeposited coatings. The investigation of initial permeability was limited to thin coatings since thick deposits were known to be virtually impermeable to gases. The gas permeability method was, however, thought to be adaptable to thick deposits if used as a tool for evaluating the quality of the coating by exploring its rate of corrosion in accelerated corrosion tests. Small degrees of corrosion which normally cannot be detected by ordinary means can be detected by gas permeability measurement.

The initially conceived program of this Project, then, was to correlate the gas permeability measurements of electrodeposits with the behavior of those deposits in atmospheric exposure tests. For reasons discussed in the body of this paper the program could not be carried out as originally planned because of certain practical difficulties involved with the permeability method.

In the course of this study a photographic method of porosity detection was developed; additional information was gained on the nature and measurement of porosity, and about the development of porosity by accelerated corrosion. Herein indicated are new lines of attack to be applied to the study of porosity and the corrodability of electrodeposits, and ultimately to the predicting of the performance of electrodeposits in service.

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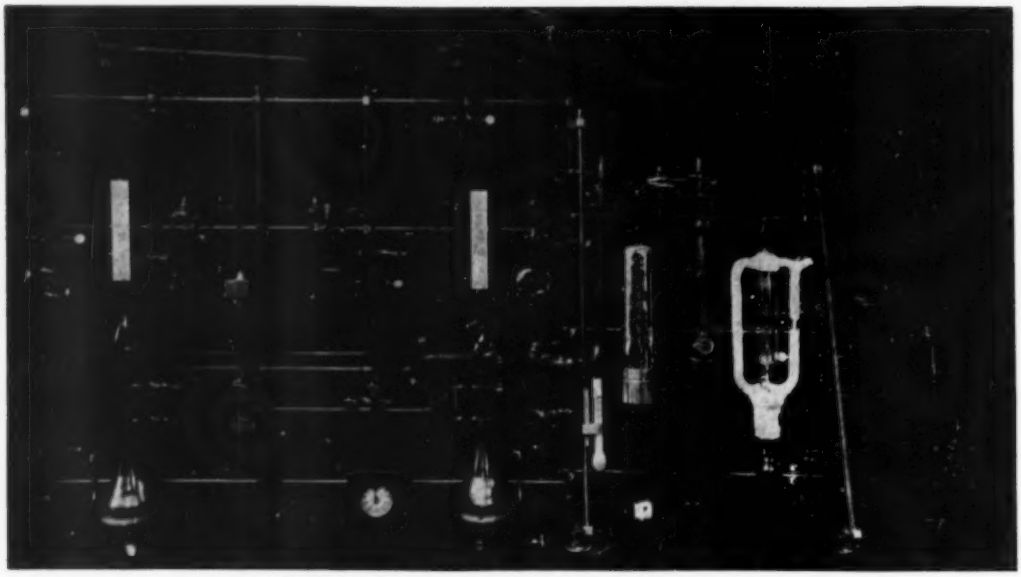


Fig. 1. Photograph of gas permeability apparatus

Measurement of Gas Permeability

The gas permeability apparatus used in this investigation is similar to that described by Thon and Keleman[1] and is shown in Figs. 1 and 2. It consists primarily of two individually controlled sections of a vacuum system connected through a foil holder. Each section is equipped with a McLeod gauge capable of measuring absolute pressures as low as 10^{-6} mm. The effective volume of each section is 1550 ml. The arrangement is such that either or both sections may be evacuated by means of a mercury diffusion pump, and air or some other gas can be admitted to either section.

The foil holder, shown in cross section in Fig. 3, is constructed of two brass parts which bear upon, and seal, the sample foil. The two fitting parts are held together with a threaded cap and are tightened by several Allen screws. The ends of the foil holder are fitted with ground-glass ball joints which allow for ready insertion into the glass vacuum system. Accommodation is provided in the apparatus for two independent foil holders. To make a measurement, one section of the system is evacuated and the gas pressure on the other section is adjusted to some desired level. The rate of change of the pressure difference across the foil, which separates the two sections of the system, is then a measure of the permeability of the foil.

The basic equation of this permeation of gas is:

$$\frac{d\triangle P}{dt} = k \times \frac{2F}{V} \times \triangle P$$

where: $\triangle P$ is the difference between the high and low pressures on the two sides of the foil;

t is time;

F is the effective foil area*;

V is the volume of each of the two sections†

and k is a permeability coefficient.

F and V are constants of the system. Therefore, as $d\triangle P/dt$ and $\triangle P$ are measured, k can be calculated. In practice, the integrated forms of this equation are employed to calculate k[2]. To cover the full range of permeabilities encountered with electrodeposited foils, pressure differences ranging from 0.01 to 760 mm are required. Consequently the average pressures will range accordingly since the apparatus is generally operated with a very low initial pressure (10^{-4} to 10^{-} mm) on one side of the foil. Hence, the average pressure on the foil during any particular run is virtually equal to one-half the initial pressure on the high pressure side. For correct interpretation of measurements, it is necessary to know whether k is dependent on the average pressure.

Table I and Fig. 4 summarize the permeability data obtained for four different foils each with several different average pressures. Within the range reported k

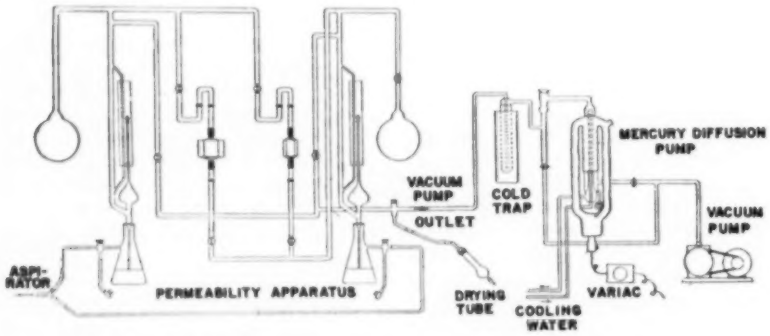


Fig. 2. Schematic representation of gas permeability apparatus

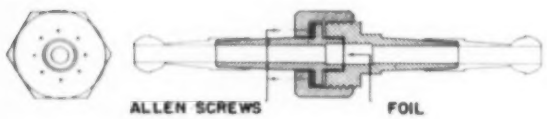


Fig. 3. Cross section of foil holder used in gas permeability apparatus

*All measurements of gas permeability reported in this paper were made on foils of 1.27 sq cm effective area.

†The apparatus described above had a volume of 1.55 liters. If the volumes of the two sections are not equal the basic equation must be modified accordingly.

approximates a linear function of the average pressure but the slope of the function is different for each foil. This difference is probably due to different types of gas flow occurring through foils of different pore structure or frequency. With another foil not listed in the table, a clear example of orifice flow was encountered. Orifice flow for air is such that when the ratio of the low pressure to the high pressure is about 0.53 or less, the rate of flow is dependent on the high pressure only.

The foregoing facts indicate that gas permeability measurements, to be strictly comparable, should be made at the same average pressure. It is quite possible, however, that the value of the coefficient, k, may be almost constant for some foils, or that for comparing widely different permeabilities, variations in k may be considered negligible.

TABLE I. VARIATION OF PERMEABILITY COEFFICIENT WITH AVERAGE PRESSURE

Foil*	Thickness (microns)	Average Pressure (mm)	Permeability Coef. (liter/sq cm/min)
G-2†	8.7	0.091	1.58×10^{-2}
		0.218	1.61×10^{-2}
		0.45	1.75×10^{-2}
G-3	9.3	4	3.7×10^{-6}
		9	4.2×10^{-6}
		22.5	4.1×10^{-6}
		50	4.5×10^{-6}
		70	4.6×10^{-6}
H-1	6	6.5	1.13×10^{-4}
		6.5	1.04×10^{-4}
		21.5	1.22×10^{-4}
		32	1.30×10^{-4}
		48.5	1.37×10^{-4}
H-2	6	114	1.12×10^{-7}
		234	1.20×10^{-7}
		355	1.24×10^{-7}

*Electrodeposited nickel.
†Corroded over 12N hydrochloric acid (thickness is that prior to corrosion)

Photographic Detection of Porosity

Since accidental holes in the foil that result from foreign particles in the bath or imperfections in the basis metal, or other sources might yield erratic permeabilities, it appeared desirable to measure the permeability of only those areas that were free of visible holes, sometimes referred to as "gross pores." A microscopic survey method had been employed at first to search for gross pores. Later, a method of photographing porosity was developed which was superior to the microscopic method. The foils used in the gas permeability apparatus were cut from areas which the photographic method showed to be pore-free.

The procedure developed for the photographic detection method involves the insertion of a foil as large as 4 x 6 inches, into a frame and the placing of a sheet of photographic film* over it, emulsion side down. The entire frame is inserted into a printing box over a source of diffuse light. A three minute exposure period was used throughout this work. When the film is developed it shows black spots wherever gross pores exist in the foil. The geometry of the arrangement, possibly coupled with diffraction or halation, results in an enlargement effect which renders the spots readily visible. The extent of enlargement can be increased by the insertion of a glass plate between the foil and film.

Although the photographic method was originally developed as an adjunct to the gas permeability method, it proved to be superior to it in some respects and, therefore, in this study was evaluated along with the permeability method. The method, as compared with the microscopic method, appears to be more reliable, more sensitive, and less tedious. It further provides a permanent record of the size and distribution of the pores over the entire area of the foil.

Initial gross porosity, as determined by photographs, appears to be dependent on several variables.

1. As the foils increase in thickness, the number of photographically detectable pores diminishes and their sizes decrease. Foils produced from a Watts' nickel bath seldom had photographically detectable pores at thicknesses greater than 25 microns (0.001 inch). See Fig. 5.
2. Impurities in the plating bath result in increased gross porosity. The pores can be reduced by filtration and electrolytic "working" of the bath.
3. The condition of the basis metal surface appears significant as the porosity can be increased by prolonged water soaking of the cathode between the cleaning and plating operations.

At this time, complete control over these and other variables and the resultant porosities has not been achieved. Project experience, however, indicates that the photographic detection method as applied to detached foils presents a tool useful for investigating the effects of many porosity variables as well as for checking the performance of plating baths. As will be shown later in this

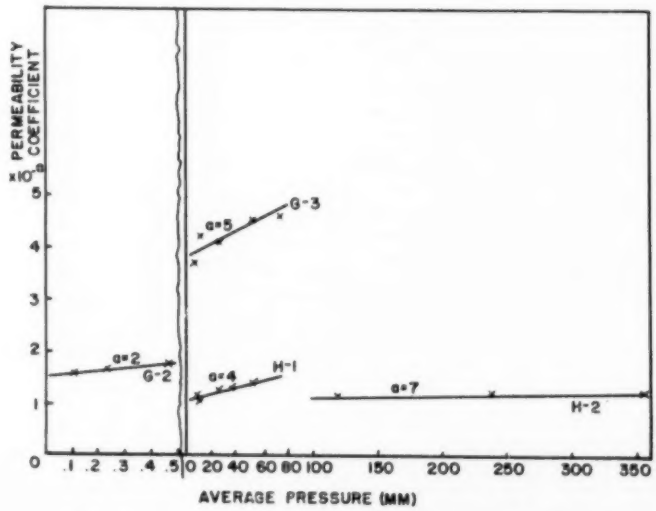
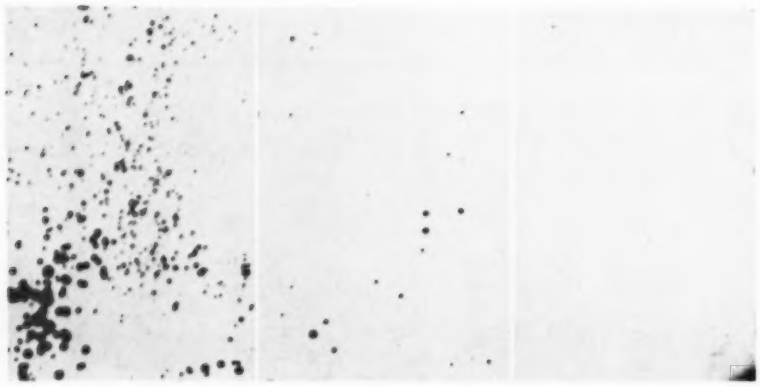


Fig. 4. Permeability coefficient versus average pressure

*Kodak Contrast Commercial Ortho.



A 5 microns *B 10.7 microns* *C 22.5 microns*

Fig. 5. Photodetectable porosities of Watts' nickel foils of different thicknesses

paper, the photographs can be taken through progressive stages of corrosion of deposits and thereby yield a record of the progress of corrosion.

Some Comparisons Between Porosity Detection Methods

It was desired to establish some estimate of the sensitivity of the Project's gas permeability apparatus as compared with the contact-photograph method of pore detection. In the course of this work some foils were found which would pass measurable quantities of gas but would show no photographically detectable pores; on the other hand the opposite was found when two uncorroded foils were chosen whose repeated photographs showed a small pore in each. Permeability measurements of these foils showed the following:

Foil	Thickness (microns)	k (liter/sq cm-min)
Y-1-4	5	$<10^{-10}$
IN-3-1	12	6×10^{-9}

The above observations indicate that there are limiting cases on either side:

(a) Foils with no photographically detectable pores may yield a measurable gas permeability.

(b) Foils with photographically detectable pores may fail to yield any measurable gas permeability.

A plausible explanation is that the hole (or few holes) in (b) is large enough to be photographed but so small that the amount of gas which goes through it is too small to be measured. On the other hand, the holes in (a) are too small to be photographed but their presence in large number passes a cumulative gas flow sufficient to be measured. Another possible explanation for (a) might involve tortuous holes which pass gas but not light. These postulations tend to be substantiated by the fact that foils in category (a) have almost invariably been corroded, a condition leading one to expect many and possibly tortuous holes; while foils in category (b) are generally new foils in which one would expect few holes.

The undesirability of measuring the permeability of small areas which might not be representative of the entire foil could be overcome by constructing a larger foil holder. Permeability measurements, however, yield only a single value for each foil, regardless of its size, and would likely result in giving undue weight to large pores. Several small disks could be cut from a large foil, but this would make the method exceedingly time-consuming and would require statistical treatment. Photographs, on the other hand, yield information about the size, number, location, and distribution of the pores either initially present or produced by corrosion of the foil. The pores detected are more closely related in size and distribution to visible coating failures than is the porosity detected by gas permeability.

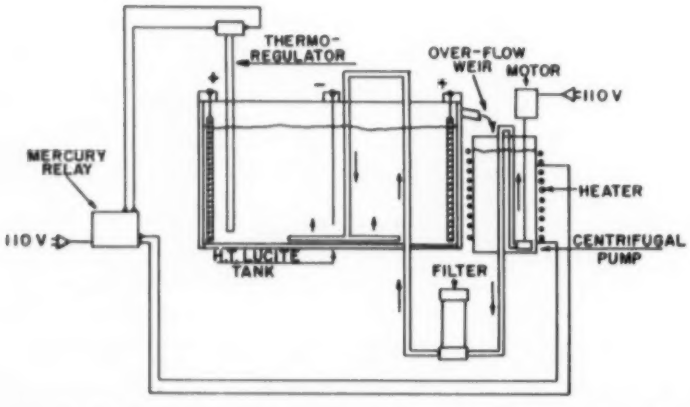


Fig. 6. Plating bath with thermoregulation and continuous filtration

Production of Nickel Foils

The foils tested generally were electrodeposited nickel coatings which had been detached from the basis metal. (In future work it is planned to test other coatings as well.) The basis metal was a strip of polished stainless steel sheet generally 10 x 15 cm (4 x 6 inches) (roughness: 15 microinch rms) which had been put through the following cleaning cycle:

1. degreaser
2. cathodic alkaline cleaner
3. water rinse
4. acid dip (30 seconds in mixture of 62 ml concentrated sulfuric acid, 78 ml concentrated hydrochloric acid, 860 ml water)
5. water rinse

The plating tank was constructed of Lucite, and was equipped with temperature and level control, constant filtration, and mechanical agitation (Fig. 6). The dimensions of the bath conformed with the recommendations of Mohler and Schaefer[3] in that the distance between the cathode and anode exceeded 1.5 times the width of the cathode. This provision ensured the production of electrodeposits of uniform thickness. The plating solution usually employed was a Watts' nickel bath with the following make-up:

	M	g/l
$NiSO_4 \cdot 7H_2O$	0.75	210
$NiCl_2 \cdot 6H_2O$	0.25	60
H_3BO_3	0.5	30

The solution was purified before use by:

(a) raising the *p*H above 5.0 with a nickel carbonate slurry

(b) adding 1 ml of 30 per cent hydrogen peroxide per liter of solution

(c) heating to 60° C and allowing to stand overnight

(d) adding activated carbon and agitating for 1 hour

TABLE II. LOW PERMEABILITY COEFFICIENTS OF THIN FOILS

Foil	Thickness (microns)	Permeability Coefficient "k"* (liter/sq cm/min)
HH-1	6.0	5×10^{-8}
HH-2	6.4	2×10^{-8}
K-5	7.0	0†
K-6	7.0	2×10^{-8}
O-1	5.8	0†
O-2	5.0	0†
OO-1	4.0	5×10^{-8}
PP-1	4.4	8×10^{-8}

*All coefficients were measured with one side of the foil exposed to atmospheric pressure. Because the pressure on the low pressure side is of the order of microns the pressure difference can be considered to be 1 atmosphere.

†"Zero" values for permeability coefficients can only be designated as zero with respect to the limits of the Project apparatus. In the above cases, a zero value for k implies a value lower than 10^{-10}.

(e) filtering

(f) operating the bath with dummy cathodes at 0.2 and 0.5 amp/sq dm for several hours each

The anodes were of electrolytic nickel sheet (99.4 per cent nickel; balance cobalt and trace elements) and were bagged with glass cloth. The operating conditions used were:

pH = 5.0
Temperature = 55° C
Current Density = 1.1 amp/sq dm

After the coating was deposited on the stainless steel cathode the edges of the sheet were filed or sheared off and the deposit on either side was easily detached by hand. The detached deposit is hereinafter referred to as the foil.

Evaluation of Deposits by Measurements of Initial Porosity

The evaluation of the protective value of a coating by measuring the initial porosity of a detached foil by either the gas permeability or photographic method is shown to have serious limitations.

1. When pore-free areas are selected from a foil by microscopic or photographic methods, gas permeability measurements made upon them prove to be limited in usefulness. Even with thin foils of the order of 5 microns thick, pore-free areas with very little or no gas permeability can be obtained. Table II shows typical data of this kind for nickel foils. It is evident, therefore, that the method cannot discriminate between such deposits. Certainly, it cannot be expected to distinguish differences in protective value between a thin and a thick deposit if even the thin one exhibits no measurable permeability.

2. Gas permeability measurements made on small areas selected irrespective of microscopically or photographically detectable porosity are also unsuitable. Examination of photographs of a large number of porous nickel foils invariably disclosed pores which, on any particular foil, were neither uniform in size nor uniformly distributed. Proper characterization of a large foil would, therefore, require a large number of gas permeability measurements. Such a procedure would be unduly time-consuming and would require substantial statistical treatment.

3. Gas permeability measurements of large areas using a large foil would reduce the number of measurements required. This was not tried, but it would have the disadvantage of giving only a single value and would not permit discrimination between a few large pores and a number of small ones. The gas permeability resulting from a few large pores would overshadow that resulting from a substantial number of small ones.

4. Nickel foils with a thickness of 25 microns (0.001 inch), or greater, seldom show any initial porosity. Indeed, as has been shown, much thinner nonporous foils can be produced. Many commercial deposits fall into the former category. Nevertheless, it is known that such coatings do, in time, corrode in service. The gas permeability and photographic methods would not be applicable to uncorroded deposits in this category, a category which is probably the most important one from a practical point of view.

REFERENCES

[1]N. Thon and D. Keleman, Plating 35, 917 (1948).

[2]N. Thon, D. Keleman and L. Yang, Plating 36, 362 (1949).

[3]Mohler and Schaefer, Monthly Rev. Am. Electroplaters' Soc. 34, 1361 (1947).

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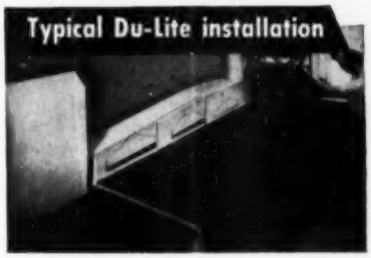

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41ST ANNUAL AES CONVENTION COMMITTEE CHAIRMEN JULY 12-15, 1954

GEORGE SCHORE, chairman for the 1954 Convention, has had wide experience in all phases of metal finishing and is indeed well known in the Metropolitan area, both as a plater and one of the most active members in the AES. He secured his degree of Bachelor of Science in Chemical Engineering from the College of the City of New York, taking evening courses while working as superintendent in several of the large plants in the area. At present he is a technical representative for the Frederick Gumm Chemical Co.

George has held all the offices of his local branch and for the past four years has been Secretary-Treasurer. His activities in the National Society are also a matter of record as are his technical papers which have appeared.

George announces that several of the committees have long been functioning and have plans for what promises to be one of the finest conventions of the Society. MILTON NADEL, educational chairman, already has received several papers for review by the Editorial Board and he promises sessions which will do credit to the AES. Milton has held office in the New York Branch for the past twelve years but promises to outdo himself in preparing an educational session which will long be remembered.

GEORGE COOPERMAN, chairman of the Exhibits Committee, has contacted the Secretaries of the local branches for cooperation in completing several new ideas he wishes to present at this convention.

As mentioned previously, MOE RANNO, Visitors' Entertainment Committee Chairman, is at work on several requests which have come in. The working of the committee and places to be visited will be covered in future releases. At Moe's request it is now mentioned that "it is never too early to plan for entertainment during the convention". He also says that should visitors wish to attend an entertainment within a few days before or after the convention, he will be glad to arrange it.

MARTIN F. MAHER, JR. and ALBERT G. FUSCO, Cochairmen of the Registration Committee, have developed a method for preregistration which they believe will avoid confusion at the registration desk during the convention. In the very near future forms will be made available for registration in advance of the arrivals by people wishing to attend the convention. If for some unforeseen reason anyone who has preregistered and cannot attend the convention, the registration fee will be refunded.

Publicity Chairman JOHN TRUMBOUR has actively been seeing that the Convention is publicized in publications in the finishing field.

PETER VEIT and DERICK S. HARTSHORN, JR., Cochairmen of the Convention Journal, are rapidly whipping into shape the data for that Journal. The proceeds of advertising space of the instrument will be used to finance one of the Convention's social functions.

JIM CLIFFORD, who has always done such an outstanding job with the entertainment for New York Branch Annual parties, has been assigned to do his usual superlative job in supplying entertainment for the Convention's closing social function.

IRVING GOLDWASSER, Branch Sergeant-at-Arms and right-hand man to General Chairman George Schore, has the job of seeing that the necessary detail efforts all fall into place to assure every conventioneer of a worthwhile and unforgettable 5 days in New York next July.

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Book Review

DR. HAROLD J. READ
Professor of Metallurgy, Pennsylvania State College

ION EXCHANGERS IN ANALYTICAL CHEMISTRY by Olof Samuelson, 291 + xviii pages, 1953. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, $6.50.

It may seem curious as well as inappropriate that a book containing almost no references to any phase of the metal finishing industry should be reviewed in this journal. From time to time, however, books appear which challenge the ingenuity of any chemist in that he is introduced to a new field of scientific discovery and development—a field which he, in turn, may possibly put to use for the solution of some of his own immediate and specific problems. Dr. Samuelson's book on the use of ion exchangers in analytical chemistry certainly falls in this category. To the best of our knowledge, his is the first book on the subject, and it is gratifying to find that he has presented a clear, comprehensive and stimulating account of a technique which promises to have manifold applications in many fields of chemistry.

Metal finishers have made excellent use of ion-exchange resins in several ways, notably for water treatment and for recovery of metal ions from rinse water. They should be receptive, therefore, to additional uses to which these versatile materials may be applied. Those who have not followed the journal literature relative to analytical applications (much of it being in rather obscure journals) will be surprised at the diversity of proven methods which have already been developed. From these one can see many possible applications to the analytical problems of metal finishing, particularly to the determination of impurities and addition agents in plating baths. Troublesome analyses, such as boric acid in nickel baths, may well be simplified by use of ion-exchange techniques.

The author has divided his book into three major portions. The first deals with the nature and the basic properties of ion-exchange resins, with ion-exchange equilibria and with the kinetics of the reactions. A discussion of the laboratory methods of ion-exchange separation for analytical purposes and of the techniques used in ion-exchange chromatography comprise the second part of the book. The third and major portion presents practical applications of the methods for inorganic and organic analyses. In addition, there are chapters on complex salts and on miscellaneous applications. The simplicity, accuracy and reliability of many of the separations and determinations are astonishing.

The excellent organization and clear writing which are evident throughout the book along with exceptionally complete author and subject indexes make the volume easy to read in a general way or to consult for specific information.

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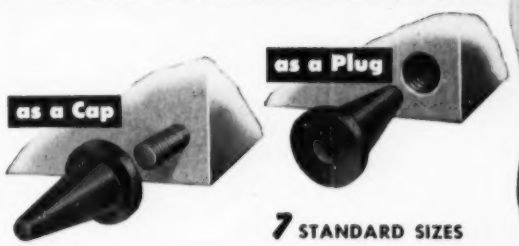

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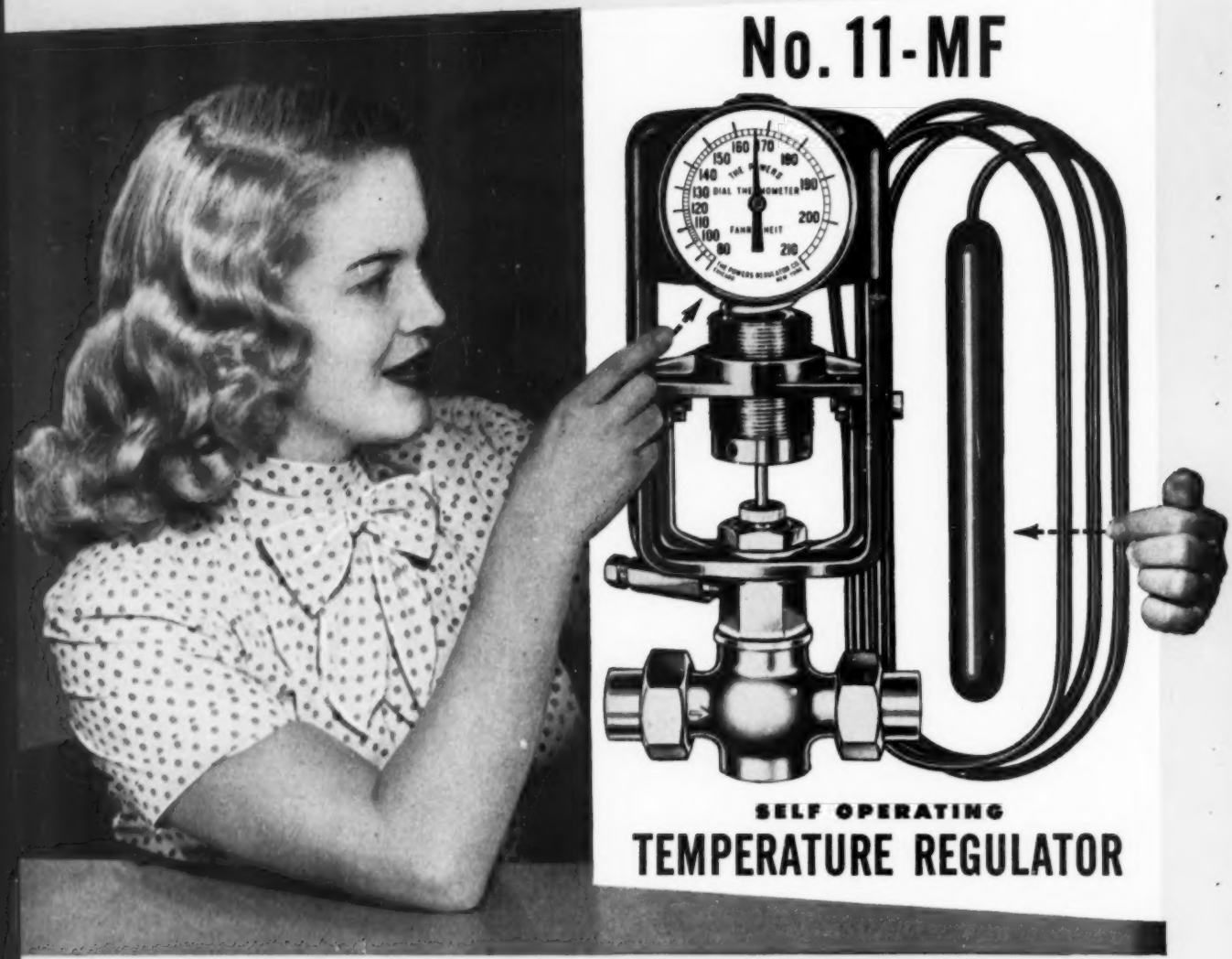

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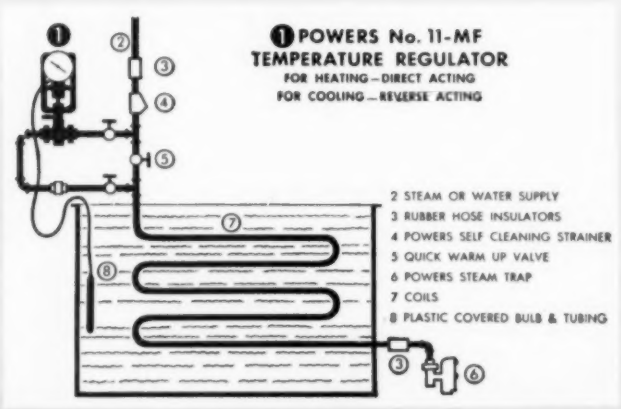

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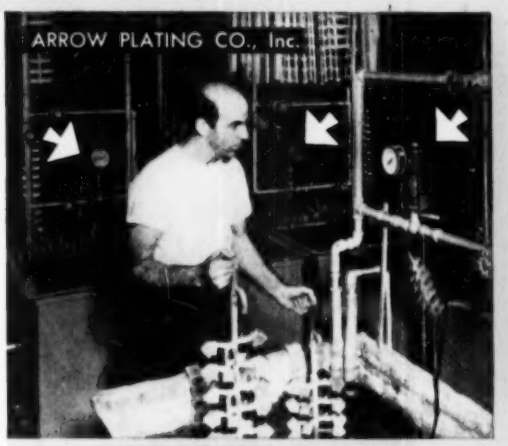

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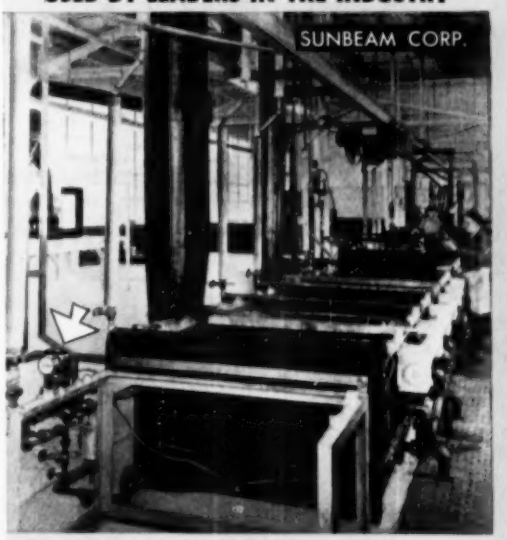

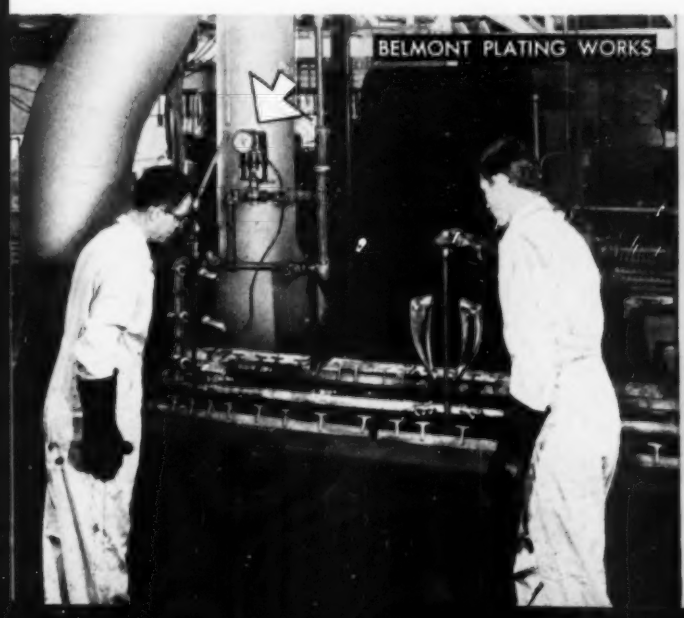

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readers' questions of general interest

Q. 170. We electroplate coatings of copper, nickel and finally gold on heat-treated steel. Little pin holes form on the parts with colored brownish and purplish circles. These can be removed by running through our cleaning cycle. However, after a few days they reappear. What is causing this?

A. The appearance of pin holes with brown circles around them would indicate corrosion through pores in the thin copper and nickel plates. Many factors are involved.

The heat scale must be removed completely and the surface given as high and uniform a finish as is permissible for the price range. The better the finish and the more uniform the metallurgical properties of the surface, the easier it will be to obtain a good jewelry finish that will not deteriorate rapidly.

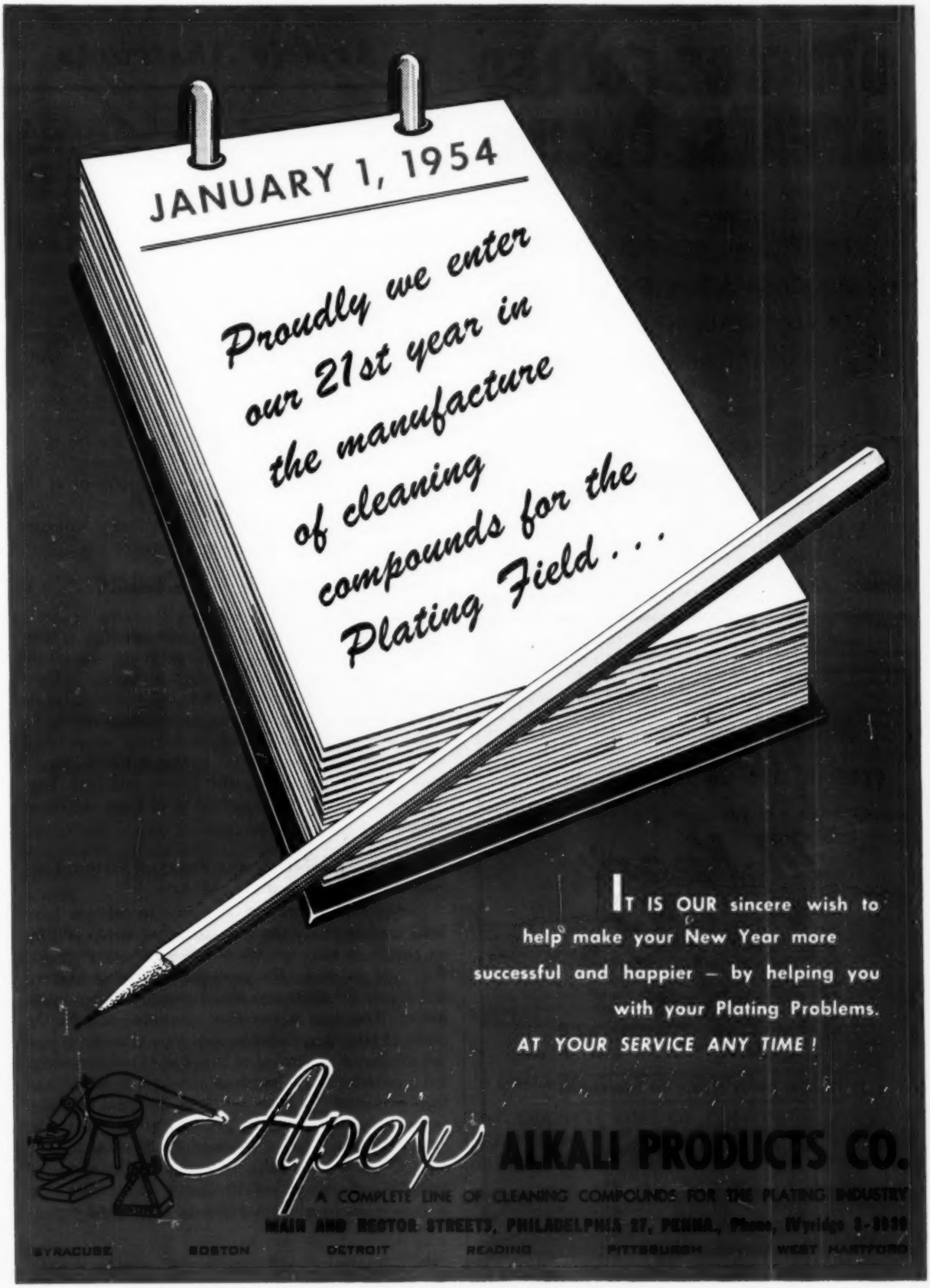
Next, dirty plating solutions will give plates with an increased number of pores or thin spots. Solutions out of balance will also tend to give poorer plates.

No mention is made of the thickness of plates, but most plates in this field are too thin. The finish of the base metal and the operating conditions for copper and nickel will dictate the minimum plate thickness. However, it is felt that there should be a minimum of 0.0003 inch for each plate after any polishing or burnishing operation that may be used to develop a higher finish. The gold plate is assumed to be a flash—in the range of 0.000002–3 inch.

There is a small possibility that impurities may be occluded in the plate and leach out, with time, through the pores. In such cases, the items, after final gold plate and thorough rinses, may be immersed in a weak, hot, chromic acid (0.01 per cent) or a slightly stronger hot dichromate solution for one to five minutes. The work is then rinsed thoroughly in cold running water, rinsed in deionized water, dipped in isopropyl alcohol and then dried in a hot-blast drier or maizo tumbled depending on the nature of the items.—EDWARD A. PARKER.

Q. 171. Can you furnish information on the process of electropurification of water by the use of silver electrodes?

A. The subject is reviewed at length by Goetz, Tracy and Harris in their article, "The Oligodynamic Effect of Silver" (Silver in Industry—Reinhold Publishing Corp., N. Y.—1940). The Katadyn-Electro process for the sanitation of swimming pools or the treatment of water supplies utilizes an apparatus consisting of a system of silver electrodes operated by direct current at 1.5 volts. The sterilization of water by such a method found successful military applications in the tropics.—A. KORBELAK.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Article Abstracts

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The Rate of Dissolution of Zinc in Chromic Chloride Solutions*. Cecil V. King and Natalie Mayer.

The relative potentials of the zinc-zinc ion, chromous-chromic ion systems might lead one to expect smooth progress of the reaction $Zn + 2Cr^{+++} \rightarrow Zn^{++} + 2Cr^{++}$. However, various other reactions are possible, and the dissolution or corrosion process is complicated; it is electrochemical in nature and in some solutions rapid enough to permit transport control of the rates. The dissolution rate is highly dependent on the form of chromic ion present on pretreatment of the metal surface, in some solutions on the acidity, and under some conditions the main reaction is hydrogen evolution with little reduction of chromic ion.

Corrosion Inhibition in Acid Solution*. Cecil V. King and Edward Hillner.

Cylinders of iron, zinc, and cadmium were rotated in a highly corrosive solution of acid containing nitrate ion as a depolarizer, as described previously. Three kinds of inhibitors were added to the solution: (a) dichromate ion plus complexing or chelating agents for metal ions; (b) a wetting or emulsifying agent which is strongly adsorbed; and (c) a reagent which forms a very insoluble precipitate with ferrous and ferric ions. Measurements of the effectiveness of these inhibitors are given.

Radioactive Tracers in the Study of Pitting Corrosion on Aluminum*. P. M. Aziz.

Radioactive cobalt and lead ions in solution have been used to study the distribution of local cathodes on aluminum alloy specimens which were actively pitting, and to study the processes of film breakdown and repair on aluminum alloy specimens after introducing them into a corrosive environment. In the study of pitting, radioactive ions were introduced into the solution after pitting of the sample had proceeded for a predetermined length of time. The tracer was then permitted to plate out onto the local cathodes and, after washing and drying, autoradiographs of the surface were prepared. The results indicate that after a pit is a few hours old it is surrounded by a ring of cathodic surface and outside this is an annular ring of passive surface which prevents the lateral expan-

*Presented at the Electrochemical Society meeting at Wrightsville Beach, N. C. (1953).

sion of the corrosive attack, the remainder of the surface being cathodic. In the study of the mechanism of film breakdown and repair, samples with different surface treatments were placed in the solution and radioactive ions were introduced after various predetermined times, exchange permitted to take place, the samples washed and dried, and autoradiographs prepared of the surface. The results indicate that, on contact with the solution, the surface oxide film breaks down and is then repaired by reaction with the solution.

Radiometric Study of the Chromium-Sulfate Complex Formed in Chromium Plating Baths*. Ronald L. Sass and Stanley L. Eisler.

Tests conducted to determine the ionic nature of the coordination complex formed and the amount of sulfate so complexed are described. It was found that the chromium-sulfate complex formed is cationic in behavior and can be removed from the plating solution by employing the appropriate ion exchange media. Approximately seven per cent of the total sulfate is bound up in the complex after electrolysis. The formation of a large complex ion is indicated by the fact that the per cent of sulfate regained from the resin column is considerably less than and independent of the amount of trivalent chromium regained.

A Study of the Variables Affecting the Particle Size of Electrodeposited Lead Powder*. James B. Crownover and Charles L. Mantell.

At the present time, electrolytic lead powder is not produced in the United States. The three major manufacturers of lead powder, the National Lead Company, Perth Amboy, N. J., the Metals Disintegrating Company, Elizabeth, N. J., and the Glidden Company, Hammond, Ind., use atomization process. To date, very little work has been done on the preparation of lead powder by electrolytic means. It is hoped that this thesis will serve as a starting point and guide for future studies of electrolytically deposited lead powder.

The Anodic Behavior of Pure Aluminum in H_2SO_4*. J. V. Petrocelli.

The anodic behavior of pure aluminum in H_2SO_4 at relatively low voltages has been studied. Conventional dc polarization curves have been obtained; in addition, ac impedance measurements have been made at each of the various dc voltages by superimposing a small ac voltage on the dc voltage and measuring the impedance with an ac bridge. The resulting data have been used to calculate the capacitance and resistance at the metal-solution interface. It is shown that these latter parameters may be used in a qualitative way to determine the thickness of the "barrier layer film" and a probable mechanism for the dissolution reaction.

*Presented at the Electrochemical Society meeting at Wrightsville Beach, N. C. (1953).

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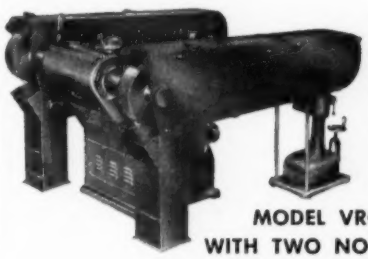

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Patent Abstracts

GEORGE B. HOGBBOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,651,610, September 8, 1953—Method of Electroplating Zinc—A. E. Chester, assignor to Poor & Company, Chicago, Ill.

CLAIM 1. In a method of controlling the electrodeposition of zinc from an acid zinc sulfate plating bath onto an electrically conducting object of a type in which the zinc would normally be deposited in greater concentrations in some areas than in others by a direct plating current; the step which comprises electrodepositing the zinc by subjecting said object in an acid plating bath to a plating current having an asymmetric alternating wave form comprising an alternating current superimposed on a direct current in the ratio of 2–4 volts rms to 2.5 volts dc, regardless of the specific current values, at current densities from about 2 to about 15 amperes per square foot.

2 claims, 3 figures, 1 example.

References cited: U. S. Patents 1,918,605; 2,063,760; 2,443,599; 2,515,192. Transactions of the Faraday Society, Vol. 24 (1928), pp. 348–358; Vol. 18 (1922), pp. 102–111. American Electroplaters' Society Monthly Review, February, 1944, p. 168. Transactions of American Electrochemical Society, Vol. 41 (1922), pp. 151–180.

No. 2,651,611, September 8, 1953—Electrowinning of Chromium—M. C. Carosella and John D. Mettler.

CLAIM 1. In a cyclic process for electrowinning of metallic chromium utilizing a compartment cell and an electrolyte prepared from iron-chromium alloys, the steps of digesting an iron-chromium alloy with dilute sulfuric acid at a temperature of between approximately 60° C, and 105° C, separating the leach liquor from the residue, adding said leach liquor under sub-

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LSI-10	100 gal/hr	12" x 16" x 16"	40 lb
ASI-300	300 gal/hr	2' x 2' x 2'	125 lb
ASI-400	400 gal/hr	2' x 2' x 2'	135 lb
ASI-600	600 gal/hr	2' x 2' x 2'	150 lb

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stantially non-oxidizing atmospheric conditions to an aqueous solution containing a base selected from the group consisting of the alkalies and alkaline earth metal basis at a temperature above 60° C until a final *p*H below approximately 3.8 is obtained to yield a granular basic chromium sulfate precipitate, separating said granular basic chromium sulfate precipitate from said solution, dissolving said granular basic chromium sulfate precipitate in a solution of sulfuric acid, adding at least one neutral salt to such solution to increase its conductivity, evaporating excess water from such solution to form a cell feed, introducing said cell feed into the cathode compartment of a diaphragm-electrolytic cell and electrolyzing to form metallic chromium at the cathode and to form in the anode compartment of such cell an anolyte containing sulfuric and chromic acids, treating said anolyte with reducing agent to convert the chromium ions therein to the trivalent state, dissolving an additional portion of said granular basic chromium sulfate precipitate with portion of said reduced anolyte and leaching an additional portion of iron-chromium alloy with the excess of said reduced anolyte.

1 claim, 1 flow diagram.

References cited: U. S. Patents 2,507,475; 2,507,476. Lloyd et al, Journal of the Electrochemical Society, Vol. 97 (July, 1950), pp. 227–234.

No. 2,652,359, September 15, 1953—Supporting Means Used in Connection with Electroplating Racks—M. S. Schneider.

CLAIM 1. In an electroplating rack the improvement which comprises an electrically conducting bus bar, an electrically conducting sleeve and a book both in electrical contact therewith, and a freely removable resilient wire article support extending with one free end into sleeve and resiliently pressing against said book, its other free end being bent to engage an article which is to be plated.

CLAIM 2. The improvement defined in claim 1 in

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which the sleeve is in the form of a helically wound wire.

5 claims, 11 figures.

References cited: U. S. Patents 1,533,805; 2,253,576; 2,258,391; 2,548,920.

No. 2,654,703, October 6, 1953—Electrodeposition of Bright Nickel, Cobalt and Alloys Thereof—Henry Brown, assignor to The Udylite Corporation.

CLAIM 1. A bath for electrodepositing fine grained bright metal selected from the group consisting of nickel, cobalt, and alloys thereof, comprising an aqueous acid solution of a salt selected from the group consisting of the chloride, sulfate, and fluoborate salts of the metal to be deposited and mixtures of at least two of said salts, said metal being selected from the group consisting of nickel, cobalt, and mixtures thereof, said solution having dissolved therein an organic sulfinate in an amount falling within the range from about 0.005 gram per liter of solution to saturation.

CLAIM 2. The bath defined in claim 1 wherein the organic sulfinate is an aryl sulfinate.

CLAIM 3. The bath defined in claim 2 wherein the aryl sulfinate is a benzene sulfinate.

CLAIM 4. The bath defined in claim 2 wherein the aryl sulfinate is toluene sulfinate.

4 claims.

References cited: U. S. Patents 2,112,818; 2,291,590. Raub et al, Metal Finishing, August, 1940, p. 430. Henricks, Metal Industry, December 11, 1942, p. 380.

No. 2,654,704, October 6, 1953—Electroplating of Nickel—Henry Brown and LeRoy B. High, assignors to The Udylite Corporation.

CLAIM 1. A bath for electrodeposition of bright nickel comprising an aqueous acidic solution of a material selected from the group consisting of nickel chloride, nickel sulfate, nickel fluoborate and a mixture of nickel fluoborate and nickel chloride, a mixture of nickel fluoborate and nickel sulfate, a mixture of nickel sulfate, nickel chloride, and nickel fluoborate, said bath also containing in solution not more than about

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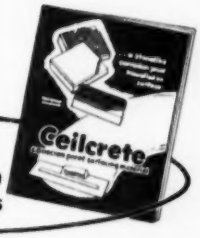

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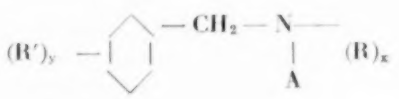
1.5 per cent of at least one brightener selected from the group consisting of organic sulfonamides, sulfonimides, and sulfuric acids, and, in addition, about 0.003 to 0.08 gram per liter of a bath-soluble compound in accordance with the formula



where , represents a compound of the quinoline series selected from the group consisting of quinoline, isoquinoline and C-methyl and ethyl homologues thereof, A is an anion of a water-soluble acid, R is a halogen, R′ is a member selected from the group consisting of halogen, nitro, methyl and fluoromethyl groups, and x and y are each zero to 2.

10 claims, 3 tables—list of addition agents.

References cited: U. S. Patents 2,315,802; 2,513,280. Raub et al, Metal Finishing, August, 1940, pp. 429-432. Industrial and Engineering Chemistry, Vol. 33, No. 12 (December, 1941), pp. 1546–1548.

No. 2,654,705, October 6, 1953—Nickel Plating—Bernard C. Case, assignor to Hanson-Van Winkle-Munning Company.

CLAIM 5. The method of preparing an anode for use in the electrodeposition of nickel which consists of subjecting a cathode sheet of electrolytic nickel to a temperature of from about 2200° F to slightly less than the melting point of nickel to modify the normal columnar metallographic structure of the metal to an equi-axed grain structure with a grain size of not less than about 0.035 millimeter and ranging to over 0.200 millimeter and averaging not less than about 0.090 millimeter.

9 claims, 3 figures.

References cited: U. S. Patents 1,433,618; 2,297,766; 2,453,757.

HEY JOE! WHAT COMPOUND AND BUFF DO WE USE ON THIS JOB?
DANGED IF I KNOW,, I'LL CHECK ON IT. SEEMS AS THOUGH ALL I GET DONE IS PAPERWORK ON THESE NEW JOBS!!!
GREASE
TRIPOLI
STAINLESS
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X Y Z CO.
NOW, IF JOE HAD ONE OF THESE HANDY, NEW SCHAFFNER "BUFF 'N POLISH CALCULATORS" HE'D HAVE ALL THE ANSWERS IN A JIFFY! SEND FOR YOURS T'DAY IT'S FREE!
WRITE SCHAFFNER NOW ON YOUR CO. LETTERHEAD.
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for buffing and drawing compound removal

Cowles LP is an anhydrous, non-silicated soak cleaner for use on all metals except aluminum. LP removes buffing compounds, drawing compounds, and other soils without pitting or depositing white film on such work as zinc base die castings, brass, steel and other alloys. LP works rapidly and thoroughly. It leaves a chemically clean surface after rinsing.

COWLES TECHNICAL SERVICE
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METAL CLEANER DEPARTMENT
7016 Euclid Avenue • Cleveland 3, Ohio

NOTE *There is more information on LP Cleaner in this booklet. Send for it!*

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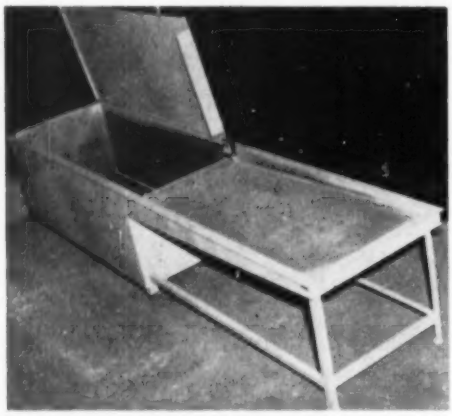

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Manufacturers of Welded Fabrications to Specification

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42ND ANNUAL EDUCATIONAL SESSION
Saturday, January 30, 1954
North Ballroom, Conrad Hilton Hotel
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PAPERS AND SPEAKERS

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DR. ALLEN G. GRAY, Technical Editor of Steel, "What's Ahead in Plating"

HARRY W. HOWARD, Shell Chemical Corp., "Organic Finishes Based on Epoxy Resins"

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B. K. STEVENS, Staff Engineer, Lear, Inc., Grand Rapids, Mich., "The Next Fifty Years—A Glimpse of the Future on the 50th Anniversary of Powered Flight"

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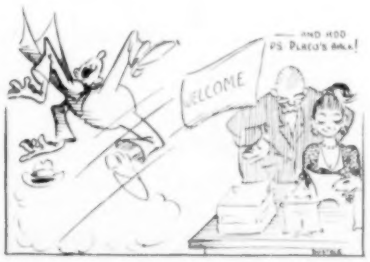

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The meeting consisted of a very interesting treatise on Vacuum Metalizing given by DR. STRONG, followed by an equally interesting question and answer period on it and associated subjects.

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A regular business and educational session was held in the Hotel Barnum on November 13, 1953. PRESIDENT CONSALVO called the meeting to order at 8:15 P. M., at which time 43 members and guests were present. The applications for membership of the following were presented: JOHN R. MORRISS, R. O. Hull & Co.; EMIL E. BERGEN, Bead Chain Mfg. Co.; JOHN D. SHAMISS, Precision Plating Co.; ARTHUR BEIBEL, Esbec Tumbling Co.

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HARRY W. HOWARD of the Shell Chemical Corporation will speak on "Organic Finishes Based on Epoxy Resins." New organic finishes based on epoxy resins promise to be more revolutionary than those made from alkyds. Here is an opportunity to get first-hand information about epoxy resins from the largest producer, the Shell Chemical Corporation. Harry Howard, technical representative of Shell, will describe their characteristics and explain how to use them for metal finishing purposes.

On the lighter side, your reporter sat in on a meeting of the banquet committee which preceded the regular meeting. Take it from him, ED STANEK and his committee are brewing a bang-up "banquup." Along with a fine meal those attending the banquet will be served an equally fine evening of entertainment.

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At the opening of the technical portion of the meeting, President Truman announced the speaker, ELMER REHME, United Chromium, Inc. Rehme gave an excellent talk on the history and development of chromium plating as well as the physical characteristics of chromium deposits under a variety of plating conditions. He also showed slides to augment his talk.

The social hour was sponsored by the Buckeye Products Company of Cincinnati.

For the November 18 meeting, 34 members and guests met at Shuller's Wigwam for dinner at 6:00 P. M., then travelled to Hamilton, Ohio where they were the guests of the Bendix Aviation Corporation.

At Bendix everyone enjoyed an interesting and informative trip through the plant.

The company guides were very gracious and made every effort to make the trip both informative and enjoyable.

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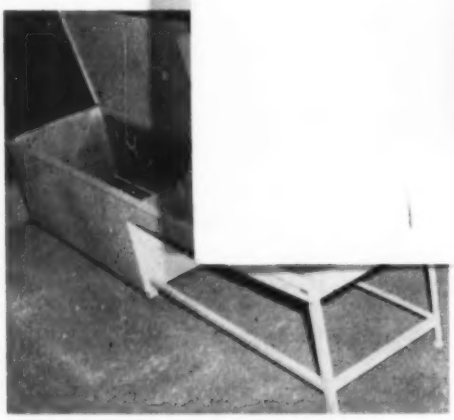

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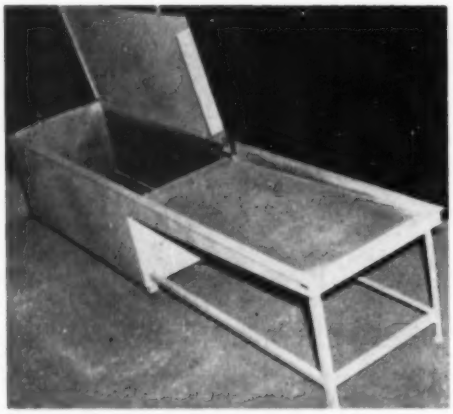

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A report given by GORDON SPEERS for the Auditing Committee's findings on the examination of the books of retiring secretary CHARLES NUZUM was accepted by motion. Another motion by Speers, and seconded by CHARLES WISE expressed appreciation for the excellent contribution of MISS EDNA RIDELL to the auditing of the books.

The minutes of the September meeting were read by BILL GORDON, acting secretary for the evening in the absence of BILL YOUNG, and were approved as read. Gordon also read a letter from W. L. PINNER, announcing the International Conference on Electroplating to be held in London in 1954. Pinner requested that suitable papers for this event be prepared by the members of the AES.

ROY CRITCHFIELD read a letter from EXECUTIVE SECRETARY P. PETER KOVATIS, announcing the date of the Interim Meeting for Toronto, February 13, 1954.

WILL LOVELESS gave a report on the activities and recommendations of the Committee for the Tri-State Regional Meeting of the AES to be held in Cincinnati on April 3, 1954. Committee chairmen were announced.

At the opening of the technical portion of the meeting, President Truman announced the speaker, ELMER REHME, United Chromium, Inc. Rehme gave an excellent talk on the history and development of chromium plating as well as the physical characteristics of chromium deposits under a variety of plating conditions. He also showed slides to augment his talk.

The social hour was sponsored by the Buckeye Products Company of Cincinnati.

For the November 18 meeting, 34 members and guests met at Shuller's Wigwam for dinner at 6:00 P. M., then travelled to Hamilton, Ohio where they were the guests of the Bendix Aviation Corporation.

At Bendix everyone enjoyed an interesting and informative trip through the plant.

The company guides were very gracious and made every effort to make the trip both informative and enjoyable.

After the trip through the plant, refreshments were served to all, courtesy of the Bendix Aviation Corporation.

The members of the Cincinnati Branch, AES, are indeed grateful to the Bendix Aviation Corporation for a thoroughly enjoyable evening.

BILL GORDON and BILL YOUNG,
Acting Secretary and *Secretary*

DALLAS-FORT WORTH BRANCH

The branch held its regular meeting on October 21 at the Lennox Hotel in Grand Prairie, Texas. There was a good attend-

There's still a NICKEL SHORTAGE! — BUT

Now you can have bright, attractive, wear-resistant chromium plated finishes *WITHOUT THE USE OF NICKEL*

LUSTER-ON® ZINC-CHROME PROCESS*

shows good results on salt spray or humidity tests

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provides good wear resistance — the hardness of chrome plate needed for tools, bumpers, etc.

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provides economical operation — high, rugged quality at lowest possible operating cost

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FOR CHROMIUM PLATED FINISHES WITHOUT THE USE OF NICKEL

Write for free data sheets and send a part for free processing

*Patent Applied for

THE Chemical CORPORATION

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ance at the meeting and dinner which preceded the meeting. Six new members were voted upon for membership in the branch.

Speaker for the evening was ALAN R. BURMAN, Vice-President of Cro-Plate Company, Hartford, Conn. Burman's talk and discussion concerning Pressure-Blast was very timely and brought us up to date on a subject which is relatively new in the field of aircraft finishing and hard chromium plating. A very active question and answer session followed the speaker's talk.

The branch held its regular November meeting on Wednesday, November 18 at the Lennox Hotel. A dinner preceded the regular meeting. Some 27 members and visitors were present. One new application was received from EARL BROWN, Collins Radio Co., Dallas, Texas.

The business session centered around the discussion for the December meeting, at which time AES SECOND VICE-PRESIDENT CLYDE KELLY will be the speaker. Plans were discussed to have a good attendance and make this one of the most interesting meetings of the year.

The meeting was turned over to the evening's speaker, RAY STRICKLEN, Development Engineer for Allied Research Products Co., Baltimore, Md. Stricklen gave a very instructive talk on Conversion Chromate Coatings for plated surfaces with special emphasis upon the chromate coatings for aluminum and magnesium. Samples of the various coatings were displayed before the branch. A discussion followed the speaker's talk.

R. H. HEPPEL, *Publicity*

DAYTON BRANCH

PRESIDENT DICK CLINEHENS called the regular meeting to order at the Biltmore Hotel on November 11 with 40 members and guests present. After a short business meeting, LIBRARIAN HOLLE LUECHAUER introduced RICHARD LAMBDON of the Kanigan Division, General American Transportation Corporation, who discussed "Immersion Nickel Plating by the Kanigen Process." Lambdon explained that their process is a catalytic type of reaction giving a uniform nickel coating on aluminum, copper, brass and bronze. The deposit contains 91 to 95 per cent nickel and 5 to 9 per cent phosphorus, has a hardness of about 500 Vickers, and has excellent adhesion. A one mil coating will withstand better than 100 hours in a salt-spray exposure test. Lambdon's discussion was followed by a lengthy question and answer session.

HERMAN AUSTEN of the National Cash Register Company then showed a series of Kodachrome slides taken of panels exposed varying lengths of time in southern Florida and in a salt-spray chamber.

Adjournment was followed by a social hour sponsored by the Pennsylvania Salt Manufacturing Company.

JOHN EASTON, *Secretary*

DETROIT BRANCH

The November 6 meeting was called to order at 8:15 P. M. at the Hotel Statler by PRESIDENT L. C. BORCHERT with approximately 135 members and guests.

Announced by SECRETARY-TREASURER R. J. RACINE were names of 16 applicants for membership, and all were voted into the Society.

Following the reports from various committees, Chrysler Corporation's color movie, "Wheels Over the Andes," was shown depicting an automobile trip over the South American mountain ranges. The meeting was turned over to FRED OLMSTEAD, Educational Chairman, who presented the principal speaker, R. Dow, United Chromium, Incorporated, who spoke on "Crack-Free Chromium." He gave, essentially, the paper published in PLATING (September, 1953, pp. 987–996). Plates were shown that demonstrated the top and cross-section structural views of the crack-free chromium in comparison with cracked and pitted chromium. Resistance to thermal stress was good, showing no cracks after being heated to 1000° F for one hour. Crack-free chromium deposited over steel and subjected to 20 per cent salt-spray test at 95° F was compared with ordinary deposits with results that the ordinary deposits broke down completely after 24 hours, whereas the crack-free deposits held up to 175 hours with only 15 per cent failure.

Examining a list of Sustaining Members credited to the Detroit Branch at the recent meeting of the AES Research Committee in the Motor City are: left to right, L. Borchert, W. L. Pinner and Drs. G. P. Swift, E. J. Serfass, W. Blum, A. E. R. Westman

RESEARCH

MORE FACTS—ABOUT THE AES RESEARCH PROGRAM

"Research for a Better Tomorrow"

The well-known research scientist, Mr. Charles Kettering, said in one of his talks:

"Research is a high-hat word that scares a lot of people. It needn't. It is rather simple. Essentially, it is nothing but a state of mind—a friendly, welcoming attitude toward change. Going out to look for a change instead of waiting for it to come. Research, for practical men, is an effort to do things better and not to be caught asleep at the switch. The research state of mind can apply to anything—personal affairs or any kind of business, big or little. It is the problem solving mind as contrasted with the let-well-enough-alone mind. It is the composer mind instead of the fiddler mind. It is the 'tomorrow' mind instead of the 'yesterday' mind."

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Join as a Sustaining Member, Today.

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INVEST NOW!!!

"YOUR BEST BET'S THE AES RESEARCH PROGRAM"

Branch News

An active question and answer period followed. The meeting adjourned at 10:00 P. M. and refreshments were served.

JOHN C. DRINKWATER,
Publicity Chairman

HARTFORD BRANCH

A regular meeting was held at the Bond Hotel on November 16 with a capacity crowd of 125 members and guests present. Preceding the meeting a movie entitled "What Makes Television Magic in the Air" was shown. Following the movie, GEORGE HOGABOOM spoke briefly on the latest developments in the plating field.

The guest speaker for the evening was ALLYN D. CHABOT, Detrex Corp., whose subject was "Cleaning by Sound or the Soniclean Process."

Chabot briefly reviewed the history of metal cleaning. He described the Soniclean process of cleaning as a combination of solvent degreasing by the use of a solvent such as trichlorethylene and sound waves. The equipment was described for producing the sound waves from electrical energy. By means of a transducer the sound waves produced in the liquid medium are beamed at the part to be cleaned. The sound waves literally explode the dirt off the metal leaving the surface clean. The talk was supplemented by slides showing the operation of the equipment and installations now in use; also, parts brought in by members were cleaned with a demonstration unit.

RALPH MCCAHAN was technical chairman for the evening.

STANLEY PLATOZ, *Secretary*

INDIANAPOLIS BRANCH

The November 4 meeting of the branch was held at the Hotel Antlers with 47 members and guests attending the dinner. After introductions of all present, the meeting opened with the secretary's report which was read and accepted. PRESIDENT ABRAHAM MAX thanked all the Columbus members of the branch who had charge of the October meeting.

HERB KENNEDY reported on the regional meeting which will be on April 3, 1954 in Cincinnati. There will be a plant visitation in the morning, luncheon at noon, educational session and dinner-dance. The Sheraton-Gibson roof garden has been reserved for the latter affair.

The following persons were voted into Society membership: JOHN M. ELTZROTH, JAMES W. GOAS, CHARLES E. KELLEY, BEN LECKRON, GUY M. MARQUIS.

An announcement was made that the Interim Meeting will be held in Toronto, Canada on February 13, 1954 at the Royal York Hotel.

The National Convention in New York is rapidly approaching and the Indianapolis Branch will present one of its members for 3rd vice-president at the election. He is TOM EVANS of Columbus, Ind. This was made in the form of a motion by ED BRUCK and seconded by Herb Kennedy.

The speaker of the evening was introduced by LIBRARIAN ROMAN BENDER. The subject, "Controls and Testing of Plating Solutions," was presented very capably by ED B. WILD of Ardco, Inc. He presented information concerning testing of various plating solutions and explained the operation of the Hull cell.

EDNA ROHRABAUGH, *Secretary*

LOUISVILLE BRANCH

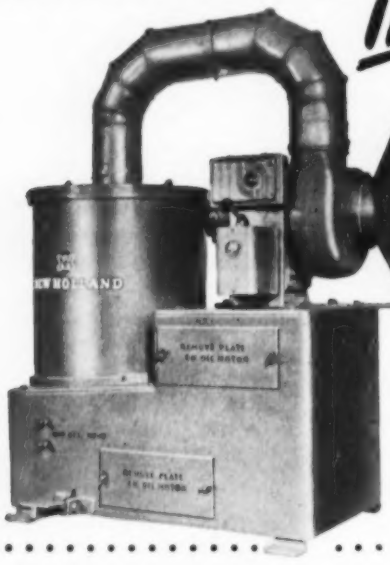
A regular monthly meeting was held on October 15 at Korfhage's Restaurant, Louisville, with a dinner being served at 6:30 P. M. PRESIDENT P. H. PATE opened the business and open meeting at 8:00 P. M. with 28 members and guests.

During the routine business of the evening, CHARLES R. BOHANNON, Jeffersonville, Ind., was voted into membership. EDUCATIONAL CHAIRMAN STANLEY J. BEYER introduced C. C. WEEKLY, Service Manager, Promat Division of Poor & Company, Waukegan, Ill., and President of the Indianapolis Branch, AES. Weekly in his talk on zinc plating delved into the history of plating and its procedure in the early days.

The talk may be summarized as follows: A good zinc solution was described:

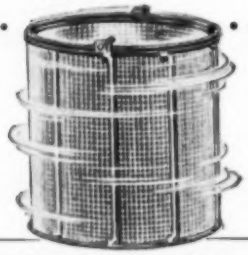
Zinc as metal	4.5 to 5.5 oz
Cyanide	12.0 to 15.5 oz
Sodium hydroxide	12.0 to 14.0 oz
Sodium carbonate	2.5 to 3.0 oz
Temperature	75 to 90° F
Current	20 to 150 amp sq ft
Cathode efficiency	78 to 90%
Anode purity	99%
Anode to cathode ratio	2 to 1

PAYS FOR ITSELF... IN TIME SAVED



Kreider Dryer with auxiliary steam heating unit (illustrated). Auxiliary natural gas heating unit available; also standard model without auxiliary heating.

Basket (below). Heavy gauge woven steel mesh over steel frame. Capacity, 1140 cu. ins.



Spin-Dries* up to 50 pounds in less than 2 minutes

Saves drying time. Kreider Dryer operates on ¾ h.p. at 625 r.p.m. . . . cuts drying time to as little as 35 secs.—no more than 2 mins.—for each 50 lbs.

Saves production time. Runs at top speed with maximum load, hour after hour, day after day. Ends drying "bottle necks". . . assures smooth, evenly dried surfaces, longer lasting lustre—fewer "rejects."

Saves maintenance time. Simple, sturdy construction reduces "time-outs" for repairs and servicing to a minimum. Assures long life.

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New Holland Machine Co., New Holland, Pa.

***Only 2 simple steps required . . .**

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

He stated also that additions to the solution should be made at frequent intervals and in small quantities for good plating and even quality.

Chromate dip finishes on zinc plated parts are very effective against corrosion. Some of these dips result in color finishes; such as iridescense and yellow and various other pleasing colors. Samples of parts, zinc plated and chromate-dip finished were passed around for inspection.

Considerable discussion followed and the speaker was given a rising vote of thanks for a very interesting talk.

Following this a General Electric Company film entitled "Clean Waters" was shown.

Meeting adjourned at 10:30 P. M.

JOSEPH G. STERLING,
Secretary-Treasurer

MELBOURNE BRANCH

The 83rd regular meeting of the branch was held at Melbourne Technical School on November 19 with PRESIDENT G. WALKER and 30 members and visitors present.

After admittance of two new members, COMMITTEEMAN J. DALE was introduced and gave an address entitled "A Review of Recent AES Technical Papers." The speaker discussed the more outstanding recent developments contained in overseas journals, with special reference to their importance to the Australian plating industry, covering both research and practical aspects.

After a discussion period, P. TIKOTIN proposed a vote of thanks to the speaker.

Meeting closed at 10 P. M.

S. B. PEARCE, *Secretary-Treasurer*

MILWAUKEE BRANCH

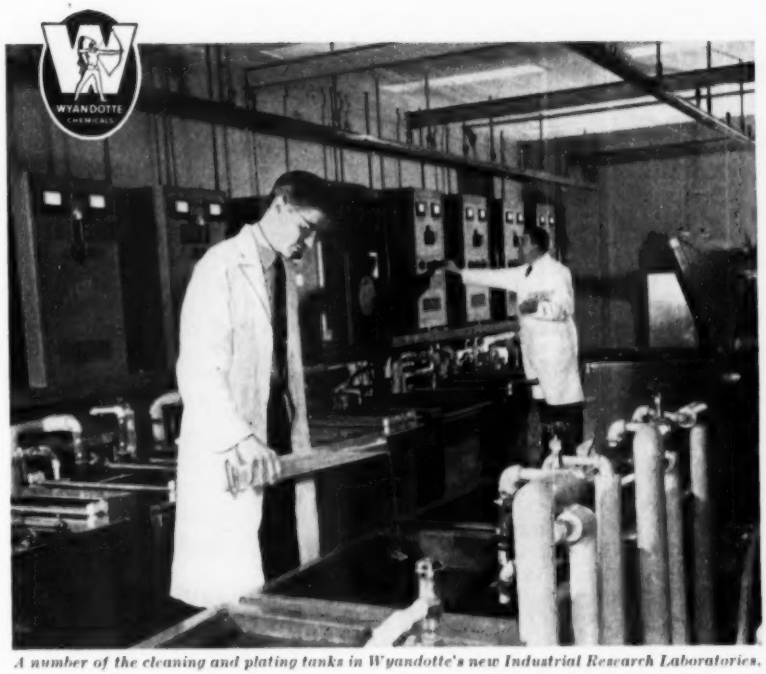
On November 6 the branch held its regular monthly meeting in the East Room of the Ambassador Hotel, Milwaukee. Twenty members became acquainted with M. K. YOUNG, the speaker for the evening, at a premeeting dinner.

Sixty-five members and guests were present as PRESIDENT F. ANDERSON called the meeting to order. Five applicants were accepted as members and a short business meeting followed. The branch was informed that the Branch Executive Board was not in favor of holding a National Convention in 1959.

L. DIVELEY reviewed a paper, "Significant Surfaces," from the Bureau of Standards and recorded the branch's opinion on this subject.

A delegate was appointed to attend the Interim meeting in Toronto in February, 1954.

BRANCH LIBRARIAN J. SCHNEIDER introduced M. K. Young, Electric Auto Lite Corp. Young spoke on the subject, "Painting and Plating of Zinc Base Die Castings." He stated that finishing of products should be kept in mind as the designer or engineer works on the product.



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F. S. for heavy-duty anodic electrocleaning of ferrous metals before electroplating. Exceptional detergency and soil tolerance.

NO. 90—a heavy-duty, reverse-current electrocleaner designed primarily for removing fabricating compounds and smut from ferrous parts. Also used on copper. Has exceptional tolerance to chrome contamination.

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This includes alloy composition, rounds and fillets, pockets, rack contacts, etc. Various methods of preparing surfaces for painting also were emphasized.

After an announcement that refreshments would be provided by F. A. Aiello, Klem Chemical Co., the meeting was adjourned.

C. Peter, *Assistant Secretary*

NEWARK BRANCH

A meeting was held on October 16 at the Robert Treat Hotel.

Previous to the meeting, 30 members met with the speakers of the evening for dinner.

Movies were shown at 8 P. M. by Howard Cobb. President Robert Hornocks called the regular meeting to order at 8:45 P. M.

A communication from Dr. Samuel Heiman was read. It pertained to a Branch Manual which is intended to serve as a guide in the mechanics of planning the programs and operation of the branches of the Society.

Membership applications from Thomas H. Donney, William Walling, Joseph G. Debernadro and Dean Ward were ordered to take the regular course while the following were elected: A. Blumenfeld and P. Peter Kovatis.

Don Foulke moved that the branch have a Past Presidents' night during which each Past President would be presented with a pin. The motion was approved.

The first speaker of the evening, Dr. Henry Linford, gave a very interesting talk on the life of the late Dr. Fink who died September 17 at the age of 71.

The next speaker was C. C. Weekly of the Promat Division of Poor & Co. whose subject was "White Brass Plating."

George Reuter, *Recording Secretary*

NEW YORK BRANCH

The October 23rd meeting, held at the Hotel Statler, N. Y., was called to order by President A. Amatore

The minutes of the previous meeting were read and approved.

President Amatore had the pleasure of announcing the presence of A. Korbelak, Editor of Plating; and P. Peter Kovatis, AES Executive Secretary and Managing Editor of Plating.

The appointment of G. Cooperman as Exhibits Chairman for the National Convention was announced.

Mr. Nadel presented to the Society a check for $100 from the Prime Plating Company, as sustaining member. Then the meeting was turned over to Librarian P. Veit, who presented S. Goble, of the American Smelting and Refining Company. Goble's talk was on "Anodes and Anode Functions," and was most interesting.

Lester Levinson,
Recording Secretary

PITTSBURGH BRANCH

The branch held its regular monthly meeting on September 2 at the Sheraton Hotel. Officers present were: Ed Washburn, Carl McHattie, Myron Ceresa, Bob Varner, Rudy Schindler, Rex Goldbach, Bob Woofter, Leo Schmitt, Sr., Doc Lancy, Ed Smith and Bill Wilson.

There were 25 members present for dinner which preceded the business meeting at which there was an attendance of approximately 45.

Librarian Myron Ceresa introduced the speaker for the evening, Dr. William Blum, who discussed "Electrodeposition of Unusual Metals." Dr. Blum also reported on his recent trip to Australia and showed some very interesting pictures that he had taken.

A very interesting question period followed Dr. Blum's address. The balance of the evening was spent in good fellowship.

Wm. D. Wilson, *Secretary*

SAN FRANCISCO BRANCH

A meeting of the branch was held on October 8 at Bertola's Restaurant, Oakland, Calif.

The business session was restricted to the reading of the minutes. The Secretary read the minutes and then addressed the Chair, stating that a mistake had been made. The mistake covered the complete omission of the appointment of a committee by President Stuart Pankey—the committee consisting of Messrs. Pattenger, Pankey and Smith. The Secretary, as a member of the committee, was to compile a list of names and telephone numbers of members who were in arrears on their dues and submit this to the committee prior to the next meeting. In turn, the members of the committee would split the list into three parts and contact the members personally.

After the Secretary's correction, Acting President Bob Hart asked if there were any other changes, and if not they were to be accepted as read. The action was made, seconded, and it was voted unanimously to accept the minutes as read, including the correction.

The meeting was then turned over to Richard Scott, The Udylite Corporation, Detroit, who gave a very interesting dissertation on the history of the development of dry stack rectifiers up to the present time including in his talk all of the latest developments.

The meeting was adjourned at 11:30 P. M., with 27 members and visitors present.

Horace J. Smith,
Secretary-Treasurer

SYRACUSE BRANCH

The first fall meeting of the branch was a high light in its history. On September 18, about 160 members and guests visited Oneida Ltd. at Sherrill, N. Y. The afternoon was spent in touring the factories, with trained guides, under the capable direction of Robert E. Pettigrew.

The New York Branch Convention Committees pictured during their recent business meetings at the Hotel Statler, New York City
(Plating *staff photos*)

Special point in these tours was an inspection of the new waste disposal plant.

Following the plant visitation a delicious dinner was served through the courtesy of Oneida Ltd., in the Sales Office cafeteria.

At the technical session the group was officially welcomed by HAMILTON ALLEN, Works Manager, who expressed the hope that some of those present might contribute some ideas for the good of Oneida Ltd. He went on to explain that his own technical organization was too busy with outside activities to bother with work. For example, ED JONES was principally concerned with getting the right shade of green for laboratory decor and his car, DAN GRAY was involved in the mathematical theory of equine behavior, and FRANK MEISLE divided his time between fishing and saving souls.

The speaker of the evening was PROF. CHARLES A. WALKER of the Chemical Engineering Department of Yale University. Dr. Walker spoke on the subject of factory waste disposal with particular reference to the problems of Oneida Ltd. He pointed out that although not the largest plant of its kind, it is one of the most complete and capable of handling the complex problems of treating a complex factory effluent.

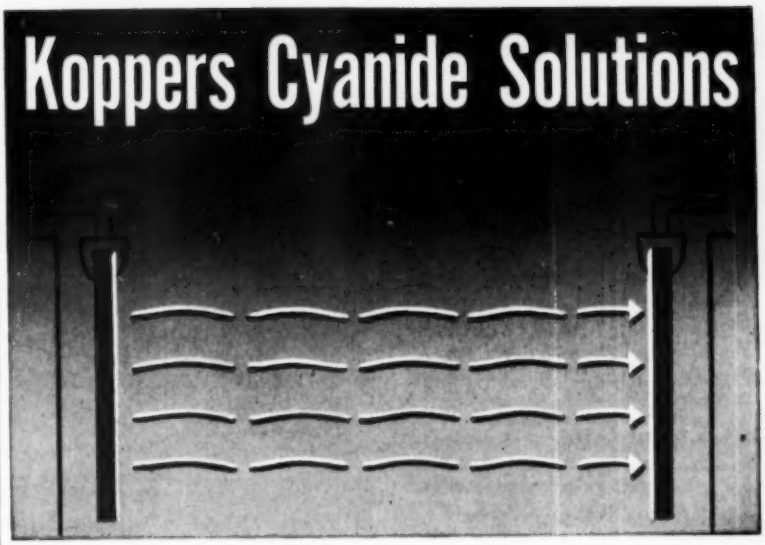
Of particular interest was Dr. Walker's description of the long and tedious preparatory work. This work involved a detailed analysis of every operation contributing to factory effluent as regards volume and composition, a study and partial rebuilding of drain lines and a tremendous amount of laboratory work, both at Yale and Oneida. He then went on to discuss the problems of designing the plant and those involved in its actual construction. Diagrammatic flow sheets were shown which made clear the various steps in treatment.

Since Dr. Walker had started from scratch on the waste disposal problem at Oneida Ltd., he was able to speak from experience in regard to all details.

A prolonged question period followed the talk. In this, Dr. Walker was assisted by JOHN MADDEN, construction engineer.

Another evidence of the widespread interest in the subject of industrial waste treatment was the number of out-of-town guests. Among the notables present were: BERTIE DAW, St. Louis, Mo.; DAVE CLARIN, New York; BILL FOTHERINGHAM, Buffalo; WESLEY L. CASSELL, Waterbury, Conn.; W. W. CHACE, Long Island City; LEONARD T. CRENAN, Philadelphia, Pa.; A. H. KIRKPATRICK, Detroit, Mich.; TED INFIELD, Schenectady; MICHAEL LUCAS, Scranton, Pa.; GERRY LUX, New York; LEONARD ROOD, Halstead, Pa.; EDWIN WALLIN, Rochester; TED DUVALL, Saratoga Springs; and many others too numerous to mention.

LINDLEY S. WOOD, *Secretary*



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Membership Report of the A. E. S.

Elections

ADELAIDE: S. Hryhorciw

BRIDGEPORT: Arthur W. Martin, Edmond Owens

DETROIT: John W. Bastuba, Clifford O. Birkhold, George A. DeCario, Jack R. DeLorge, Kenneth W. Dolby, Ronald W. Greiner, Margaret A. Halman, George G. Hoehne, Esko A. Isotalo, James M. Knott, Alexander F. Krivacs, James Parr, Robert Phillips, LeRoy Rumbaugh, Philip J. Smith, Jr., John D. Tebben, Francis X. Woods.

GRAND RAPIDS: Robert O. Bennett, Fred W. Cook, Charles W. Crane, William J. Griffin, John J. Kenny, Jr., Patrick H. Norton, William S. Springer

HARTFORD: Anthony Baron, Walter Bezrudczyk, Eugene G. Chapdelaine, Joseph A. Danis, Andrew Dzurilla, Ludwik Gutmajer, Robert B. Johnstone, Cornelius J. Mullaney, Robert L. Ramsey, Edward Walter

LOS ANGELES: Clarence E. Askew, Donald W. Baudrand, Charles W. Crowl, Kearman McBride, Jerry O. Nahring, Norman F. Painter, Harry A. Smith, F. Marion Sutton, George A. Urry

LOUISVILLE: Charles R. Bohannon

MELBOURNE: K. F. Dugan, G. W. Grimes, Alfred C. Isaacs

NEWARK: Martin A. Blumenfeld, Joseph G. DiBernadro, Thomas A. Downey, P. Peter Kovatis, William T. Walling, Dean E. Ward, Joseph G. Schmerin

NEW YORK: Victor G. Court, Thomas Dellaratta, Alfred F. Ehrensberger, Isidore J. Feldman, Frank R. Gill, George Henry, Arthur H. Johnson, Arthur Kaye, Stanley M. Missewicz, Philip Parmenter, William Tilles

PITTSBURGH: Ezra E. Best, Jr., Eugene C. Momeyer, William J. Musmanno

PROVIDENCE-ATTLEBORO: Donald Anderson, Joseph P. Wildgoose

ST. JOSEPH VALLEY: Arthur G. Wiegand

SYRACUSE: Herman A. Schneur

TORONTO: Leslie J. Clark, Leslie R. Hoyland, Jim Petrie, Harold Reece, James St. Louis, Lester Tompkins, John W. Westcott

WICHITA: A. L. Paxhia, Chester L. Ziesenis.

Membership Competition

BRANCH	Membership April 1, 1953*	New Members	Net Change in Membership	Per Cent Net Change	Sustaining Membership Credits
First Group					
Los Angeles	236	37	+29½	+12.5	14
Hartford	151	18	+11	+ 7.3	5
New York†	352	34	+21	+ 6.0	15
Grand Rapids	173	12	+10	+ 5.8	13
Detroit	504	47	+28	+ 5.6	51
Newark	251	15	+11	+ 4.4	11
Cleveland	236	15	+ 8	+ 3.4	20
Philadelphia	198	17	+ 3½	+ 1.8	11
Pittsburgh	142	6	+ 2	+ 1.4	6
Chicago	477	16	+ 6	+ 1.3	82
Waterbury	130	6	+ 1	+ 0.8	13
Melbourne	169	19	+ 1	+ 0.6	..
Boston	155	0	− ½	− 0.3	6
Toronto	146	11	−13	− 0.9	▲
Bridgeport	158	9	− 3½	− 2.2	4
Milwaukee	164	16	−20	−12.2	8
Second Group					
Dayton	76	11	+ 8	+10.5	3
Montreal	80	8	+ 8	+10.0	▲
Twin City	71	4	+ 2½	+ 3.5	1
Syracuse	128	17	+ 4½	+ 3.5	4
Rochester	107	8	+ 3½	+ 3.3	3
San Francisco	74	10	+ 1½	+ 2.0	1
Saginaw Valley‡	103	5	+ 2	+ 1.9	..
St. Joseph Valley	78	7	− 1	− 1.3	3
Sydney	82	8	− 2	− 2.4	..
Baltimore-Washington	93	7	− 3	− 3.2	4
Cincinnati	92	4	− 3	− 3.3	2
Indianapolis	105	6	− 4	− 3.8	1
New Haven	100	..	− 5½	− 5.5	7
Providence-Attleboro	95	3	− 5½	− 5.8	2
Buffalo	106	1	−12	−11.3	2
St. Louis	109	8	−16½	−15.1	10
Third Group					
Springfield	57	10	+ 9	+15.8	2
Western Ontario	22	2	+ 2	+ 9.1	▲
Rockford	63	5	+ 5½	+ 8.7	3
Adelaide	52	6	+ 1	+ 1.9	..
Houston	42	1	+ ½	+ 1.2	1
Columbus	52	1	+ ½	+ 1.0	1
Kansas City	46	6	0	0	..
Southeastern	50	2	0	0	1
Hamilton	25	..	.....	.....	▲
Lancaster	69	..	.....	.....	2
Jackson-Lansing	61	..	− ½	− 0.8	..
Allentown-Reading	53	..	− 4	− 7.5	5
Dallas-Fort Worth	53	..	− 5	− 9.4	2
Toledo	56	3	− 7	−12.5	3
Louisville§	44	2	− 5½	−12.5	2
Wichita	41	5	− 7	−17.1	2
Canadian Branches ▲					22
Credits to be allocated					4
Outside Competition					
Portland	...	18	.....	.....	..
At Large	138	20	+17½	.....	..
Total AES	6,065	466	+97½	+ 1.6	346
Active Membership, November 30, 1953					6,163

*Subject to correction. †, ‡, §Winners in first, second and third groups, respectively of 1952–1953 membership competition. ▲Proper credit to individual Canadian Branches not available.

LEA newsreel

JANUARY 1954

LEA COMPOUND

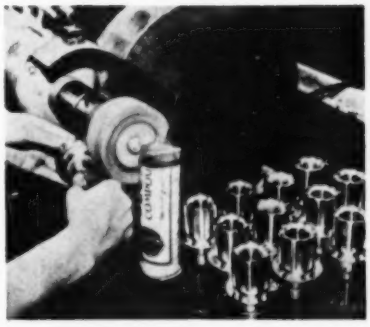
A greaseless composition for polishing, buffing, burring and satin finishing.

Lea Compound is a greaseless composition containing an abrasive or mixture of abrasives bonded together with glue. When applied to a revolving wheel sufficient heat is generated by friction to cause the compound to melt and be transferred to the wheel. Almost immediately it dries or sets up, forming a dry, abrasive-coated wheel with a flexible surface. The use of Lea Compound provides a short cut between polishing and buffing, eliminating polishing wheels in the finer numbers and

rendering easier the job of buffing and coloring.

Lea Compound is not limited to rigid polishing wheels but can be successfully applied to cloth, leather and string wheels of any degree of flexibility. On sewed muslin buffs, pocketed buffs, full-disc loose buffs, packed buffs and string wheels, a degree of flexibility never approached by the conventional set-up wheel is available to the operator.

While the abrasive grains are held securely to the surface of the wheel, the extreme flexibility of the wheel combined with the thin layer of abrasives avoids holding the grains in a rigid position. Therefore, they do not cut as deeply into the surface as grains of a set-up wheel would. Flexibility of the Lea Compound wheel cushions the cutting action of the abrasive grain, whereas with conventional polishing wheels this effect can be obtained only by the use of excessive lubrication.



LEAROK

A no-free-grease buffing composition for high lustre or mirror finishing. A special process developed by Lea Technicians has resulted in the production of Learok buffing and coloring compositions containing no-free-grease. This process of manufacture enables the production of compounds differing materially from the ordinary type of buffing and coloring compositions which contain excessive amounts of grease not absorbed by the abrasive powders. Having no-free-grease to transfer back from the work, the use of Learok eliminates the necessity of scrubbing or excessive cleanings.

Savings are particularly noticeable when work containing contours, ornamentations or filigreed decorations is being buffed, or when work such as drawn shells, which must be handled on chucks, is being finished. Learok may be used on such materials as aluminum, brass, carbon steel, copper, hard rubber, nickel alloys, pewter, plastics, stainless steel, sterling silver, etc.

OTHER LEA PRODUCTS INCLUDE

LEA LUBAR . . . a bar form lubricant for polishing wheels and belts where glazing is not a problem.

cLEAn GRAIN LUBAR . . . a special bar form lubricant to eliminate glazing on polishing wheels and belts.

LEA LIQUALUBE . . . a water soluble liquid lubricant for polishing wheels and belts; can be sprayed or brushed on.

AD-LEA-SIVE . . . glue base adhesive for sizing buffing and polishing wheels and belts prior to the application of Lea Compound.

LEABRAMENT . . . greaseless, non-flammable, quick drying liquid abrasive, for burring and polishing; can be sprayed or brushed on the wheel.

LEA LIQUABRADE . . . clean working, fast cutting and mirror finishing liquid buffing compounds providing in effect continuous operation and substantial economies in composition and buffs; clean and safe, non-inflammable, non-explosive; many abrasive types and grain sizes for all ferrous and non-ferrous metals, steel, stainless alloys, or plastics.

LEA SYNSTRIP . . . a high speed liquid stripper for synthetic enamels and other organic coatings; leaves non-ferrous surfaces smooth; no etching.

LEATARDENT . . . anti-stain, dipping emulsion; prevents staining and tarnishing of plated surfaces.

LEA ANALYTICAL METHODS . . . platers' short-cut methods for analyzing plating solutions.

THE LEA MANUFACTURING CO.
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NEW YORK: Charles Giordano

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Norman A. Searles to Syracuse from Boston; James Whyte, Jr., to Los Angeles from Bridgeport; Emmett H. Babcock to Indianapolis from Chicago; George Cook from San Francisco to Chicago; Frank Hartwig to Indianapolis from Chicago; Edwin Ratterman from Detroit to Chicago; C. L. Ricketts to Cleveland from Chicago; Clarence G. Ozar to Syracuse from Cleveland; Jack Kershaw to Cleveland from Grand Rapids; R. O. Watson from Detroit to Grand Rapids; Joseph F. Loersch from Syracuse to Hartford; Otto Kardos from New York to Newark; W. Treadwell from Rochester to Newark; Sam Rosenblatt from Providence-Attleboro to New York; S. S. Johnston to Member-at-Large from Pittsburgh; G. S. Woodruff to Jackson-Lansing from Pittsburgh; Isidore Cross from New York to Waterbury

Resignations

CHICAGO: Victor P. Casperson, Richard D. Giesel
CINCINNATI: Edward H. Kuehner
CLEVELAND: Archibald T. Miller
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PROVIDENCE-ATTLEBORO: E. J. Pelchat

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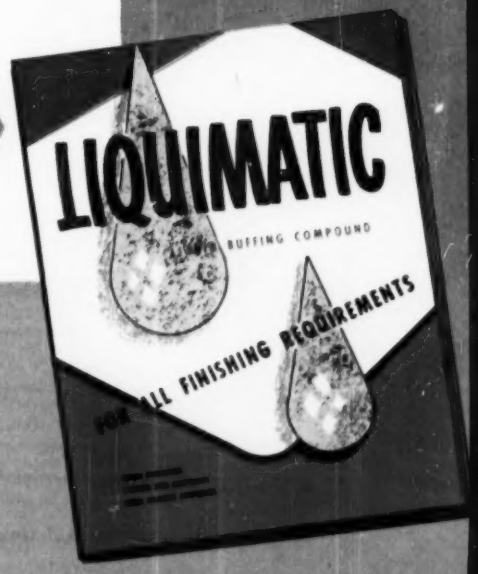

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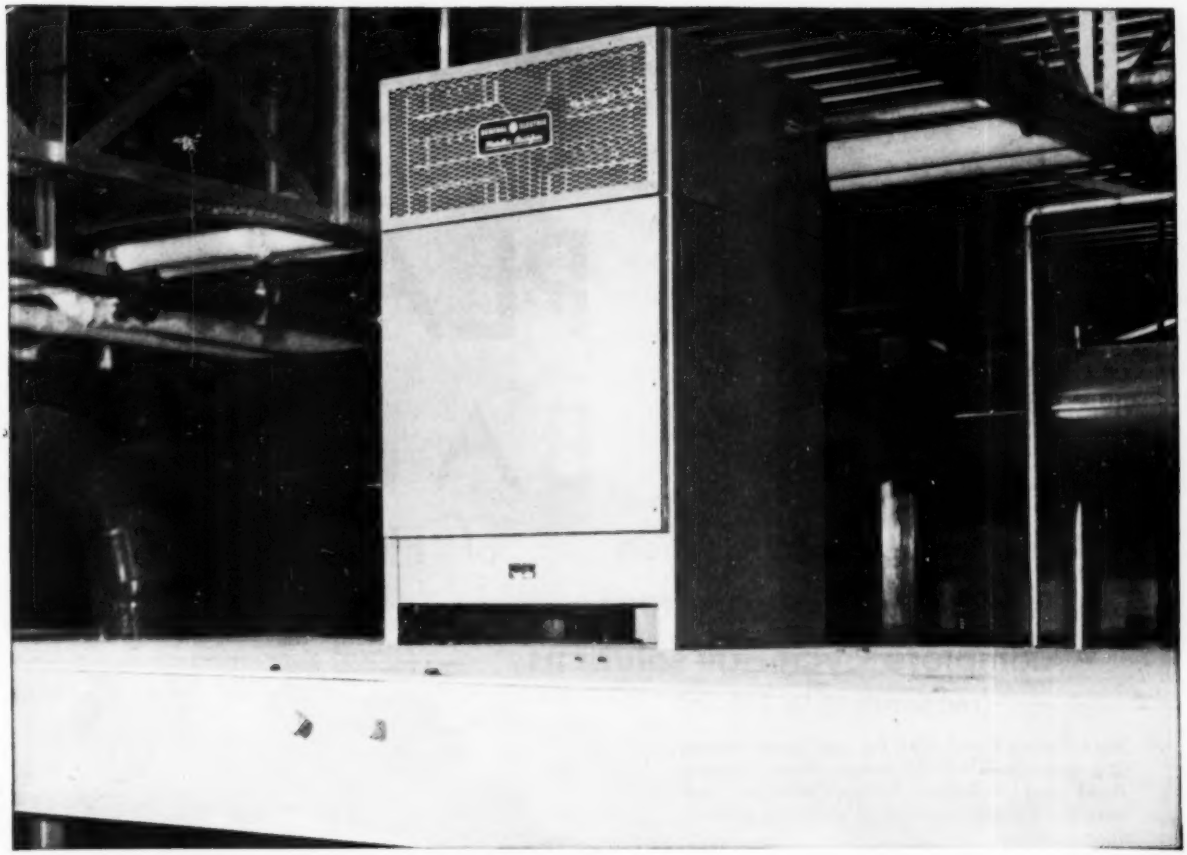

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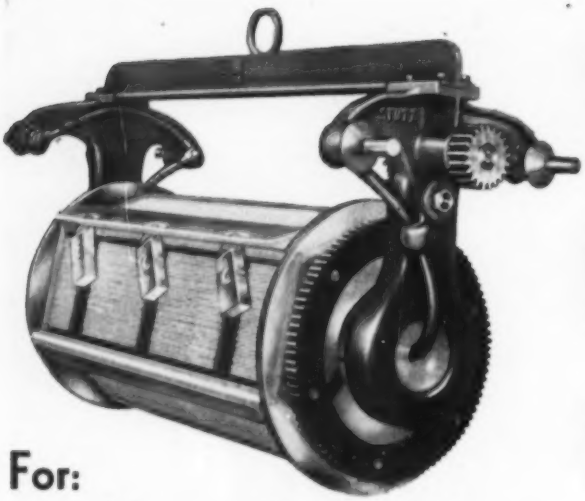

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- Complete Cycle—all solutions

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Stutz Plating Barrel Unit for continuous operation through Alkali Cleaning, Acid Pickling, Acid and Alkaline Plating solutions and rinsing. Largest number of cylinder perforations possible.

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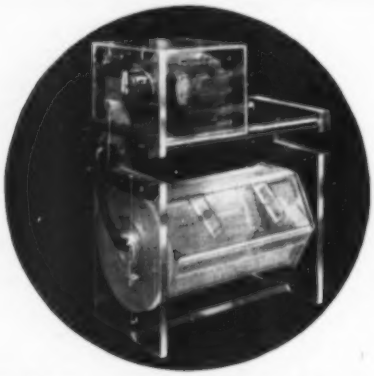

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GRAND RAPIDS BRANCH, AES, Annual Educational Session and Banquet at the Pantlind Hotel on January 23, 1954.

EDITORIAL BOARD, PLATING, regular meeting at the Conrad Hilton Hotel, Chicago, on January 29, 1954.

CHICAGO BRANCH, AES, Annual Educational Session and Banquet at the Conrad Hilton Hotel on Saturday, January 30, 1954.

ST. JOSEPH VALLEY BRANCH, AES, Annual Inspection Trip, February 3, 1954.

SAGINAW VALLEY BRANCH, AES, Annual Dinner-Dance at Zehnder's Hotel, February 6, 1954.

INTERIM MEETING, AES, at the Royal York Hotel, Toronto, Ontario, Canada, on February 13, 1954 at 10:00 A. M.

DAYTON BRANCH, AES, 9th Annual Educational Session and Dinner-Dance at the Biltmore Hotel on February 27, 1954.

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1. MIRROR BRIGHT DEPOSITS — takes less nickel to produce bright plate.
2. GOOD HIDING POWER — does not magnify defects in base metal.
3. EASILY CONTROLLED — does not require a chemist to be constantly analyzing the solution.
4. EXCELLENT THROWING POWER — covers recesses so that nickel solution does not dissolve diecastings and contaminate the nickel.
5. 100% EFFICIENT — no fuming.
6. EASILY RINSED — no problem in covering copper with nickel.
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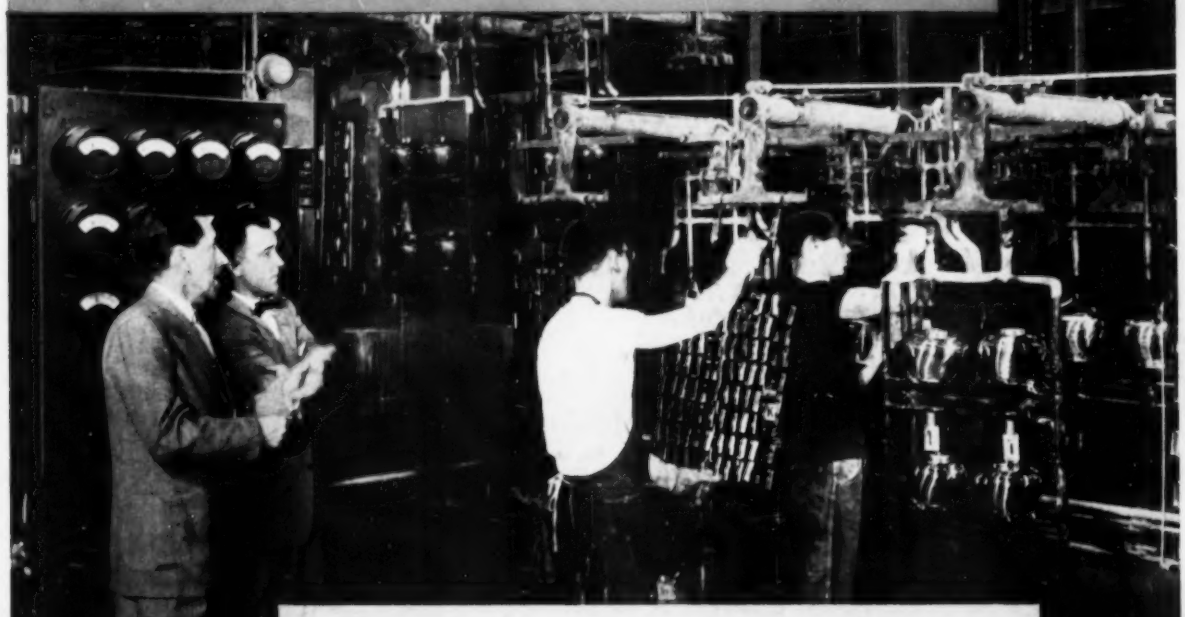
...and here is the double file loading feature of H-VW-M Full Automatic Conveyors



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